JOINT CONVENTION ON THE SAFETY OF SPENT FUEL MANAGEMENT AND ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT

CANADA'S RESPONSES TO QUESTIONS

APRIL 2009

Joint Convention - Responses to Questions Posted to Canada in 2009

Q. No 1	Country	Article	Ref. in National Report
	Hungary	Planned Activities	K.5 p.104
Question/ Comment	Has the deep geological disposal option been selected mainly because of local public acceptance? Can a host rock of the same quality be found much closer to the surface?		
Answer	The host community indicated a preference for a deep geologic repository versus a surface or near-surface facility. In the upper 400 m, the rock is of lesser quality. From 400 m to 600 m, the rock is low-permeability shale which could have been used. However, the decision to go to 680 m was based on better constructability in the higher-strength limestone rock.		

Q. No 2	Country	Article	Ref. in National Report
	Romania	Planned Activities	Section K, page 105
Question/ Comment	It is mentioned that "In April 2004, the Kincardine Council passed a resolution to "endorse the opinion of the Nuclear Waste Steering Committee and select the Deep Rock Vault option as the preferred course of study in regards to the management of low- and intermediate-level radioactive waste." The DRV has the highest margin of safety and is consistent with best international practice". Please provide us more information on advantages / disadvantages of selected solution (DGR) in comparison with covered above-ground concrete vault.		
Answer	Advantages are: • The site has extremely low permeability rock from 400 m to 800 m, which provides a high level of confidence of waste isolation and containment for very long periods of time. • A cost comparison at the time did not show a major difference between the two options. At these depths, the repository can now host long-lived intermediate level waste.		

Q. No 3	Country	Article	Ref. in National Report
	Ukraine	Planned Activities	Para K.5.1, page 105
Question/ Comment	Please, give an example of a procedure and basic criteria for selection of this site for deep geological storage?		
Answer	Factors affecting site selection: • The site is already host to a centralized interim storage facility, where low- and intermediate-level waste has been stored since 1972, for all 20 power reactors in Ontario. • The host community asked OPG to look at long-term options for managing the existing waste on site. • It was expected that the site possessed excellent geological conditions for a deep repository. This has been subsequently confirmed. The site was not selected through an assessment of alternative sites. The Kincardine community came forward and fully participated in a joint study of		

alternatives for long-term management at the current site. Please see www.opg.com/dgr for more details.

Q. No 4	Country	Article	Ref. in National Report
	Hungary	General	Executive Summary, 3.1(b), p.2

Question/ Comment: What was the opinion of the stakeholders according to the comments invited through the Web site, the surveys and e-dialogues initiated by NWMO? What did the NWMO change according to the information gained by this way?

Answer: During the 2007-2008 dialogues, NWMO sought to understand the public expectations for NWMO as it implements Adaptive Phased Management, the long- term management plan for spent fuel.

From Summer to 2007 to March 2008, NWMO invited the public to comment on its draft Strategic Objectives and proposed directions for the first five-year plan. A brief discussion paper was prepared, to initiate the dialogue. Detailed reports on what NWMO heard are available on its website, at www.nwmo.ca.

Some highlights of the stakeholders' comments include:

- A message of confidence in NWMO and its processes. NWMO was advised to continue with its values and commitment to engagement, openness and transparency.
- Involve citizens, Aboriginal people, and communities early, and sustain engagement over time. Provide capacity-building resources for communities and organizations. Increase involvement of young people, for the inter-generational transfer of knowledge, during the decades of implementing the Adaptive Phased Management.
- Address the impact of changing nuclear energy policies on the implementation of Adaptive Phased Management. Most people urged NWMO to factor into its plans the additional used fuel coming from new reactors being built, and to be transparent, while plans are adapted over time.
- Aboriginal people raised the need to interweave Aboriginal traditional knowledge with western science in NWMO's ongoing work.
- Seek opportunities for independent peer reviews/third party reviews of NWMO's activities.
- Reviewers discussed challenges associated with raising awareness and informing citizens about NWMO and APM, sustaining citizen engagement, earning and retaining trust, and adapting plans over time.
- NWMO should move forward to the next phase of engagement. Many organizations expressed interest in working with NWMO, and some even expressed their interest to develop protocol agreements, to formalize their collaboration and communication.
- Much interest was expressed in the development of processes and criteria to guide the selection of a site. NWMO was encouraged to provide a clear project description, including the socio-economic effects for a host community.

With the input received, NWMO developed a Draft Implementation Plan for 2008-2012 and Draft Transparency Policy, which were issued for public review and comment in Spring 2008.

- Overall, comments were supportive of the Drafts, as providing transparency in NWMO's operations. People commented on each strategic area in the plan, identified gaps and offered suggestions for more clarity in some areas. For example, NWMO was asked to be more explicit about work on transportation. Reviewers emphasized the need for accountability, and suggested NWMO should propose a mechanism for regularly reporting its progress against each five-year plan.
- Many were interested in seeing more detailed workplans against these strategic areas.
- Several suggestions were made in regards to NWMO's future development of the site selection process, and its public engagement and communications initiatives.

Based on the input received, in June 2008, NWMO revised and finalized its Implementation Plan for 2008-2012 and Transparency Policy. Many of the comments have led to the development of specific work programs, such as the establishment of a youth roundtable, protocols with various stakeholder groups, the development of a site selection process, the establishment of an independent technical review group, workshops to advance understanding of Aboriginal traditional knowledge, and a new work program for review and adaptation of plans to changing energy policies.

Q. No 5	Country	Article	Ref. in National Report
	Hungary	General	Executive Summary, 3.1(b), p.2
Question/ Comment	How did the communication between the NGOs and the CNSC/industry change after establishing the Non-Governmental Organization Regulatory Affairs Committee?		
Answer	The establishment of the Non-Governmental Organization Regulatory Affairs Committee (NGO RAC) provides another vehicle for communication and exchange of information. It has been used to draw early attention to specific issues of interest and concern. The CNSC has not tracked the effects on industry / NGO RAC members' communications, but remains committed to utilizing all the available lines of communications for an open and timely exchange of information with its stakeholders and the public.		

Q. No 6	Country	Article	Ref. in National Report
	Hungary	General	Annex 5 p.148, p.158
Question/ Comment	What is the volume reduction factor of the solid waste compactor? Do you use high-pressure compactors?		
Answer	The compactor used by Ontario Power Generation at the Western Waste Management Facility is a radioactive waste box compactor. It has a maximum compaction force of 1.8×10^6 N. The main hydraulic system has a maximum		

operating pressure of 12.3 MPa, supplying two compaction rams.

Q. No 7	Country	Article	Ref. in National Report
	Romania	General	Section A, page 10

Question/ Comment: Does the nuclear substances include NORM?

Answer:

"Naturally-occurring nuclear substances, other than those that are or have been associated with the development, production or use of nuclear energy, are exempt from the applicable of all provisions of the *Nuclear Safety and Control Act* (NSCA) and the regulations made under the NSCA, except the following:

(a) the provisions that govern the transport of nuclear substances *(Packaging & Transport of Nuclear Substances Regulations)*; and

(b) in the case of a nuclear substance listed in the schedule to the Nuclear Non-proliferation Import and Export Control Regulations, the provisions that govern the import and export of nuclear substances."

Q. No 8	Country	Article	Ref. in National Report
	Ukraine	General	

Question/ Comment: What methods of internal dose calculation are used for uranium recovery facility personnel?

Answer:

1) Uranium Mills

At uranium mills, internal dose is assessed from area air monitoring and time card data for each worker. The concentration of uranium in air is measured at work locations in the mill. In order to assign a dose, each worker's time spent at these work locations is used to assign a uranium intake, which is compared to the Annual Limit on Intake (ALI) for the type of uranium compounds present at the work location. Default values of ALIs for the inhalation of various uranium compounds (such as calcined and non-calcined yellowcake) were recommended by the CNSC on the basis of in-vitro dissolution studies of Canadian uranium mill workplace samples. The dose is calculated in this manner on a quarterly basis. In addition to workplace air monitoring, uranium-in-urine is assessed, as an indicator of intake and a trigger for further action. Doses are not assigned on the basis of urinalysis at the uranium mills.

2) Uranium Conversion Facilities

There are two uranium conversion facilities in Canada:
At the Cameco Blind River Refinery (BRR), uranium concentrate is converted to UO_3; while at the Cameco Port Hope Conversion Facility (PHCF), two processes take place: a) UO_3 is converted to OU_2 and b) UO_3 is converted to UF_6.

At both the BRR and PHCF, uranium-in-urine is assessed through a procedure called "Inductively coupled plasma mass spectroscopy" (ICP-MS), which is used in determining doses from exposures to soluble uranium compounds. The urinalysis program also verifies that the uranium kidney toxicity criterion of 3 µg/g has not been exceeded.

The licensee also owns and operates a mobile lung counting system, which consists of four large-area germanium detectors, mounted in a shielded counting chamber. The detectors are BeGe detectors of 80 mm in diameter, calibrated via two procedures - the Lawrence Livermore National Laboratory standards and the Japanese Atomic Energy Research Institute torso phantoms. Each of the monitored workers' chest wall thickness (CWT) has been determined using a medical ultrasound unit. The MDA for a 1-hour count (CWT = 3.8 cm) is about 6 mg U (nat.), using the U-235 photopeak. A spectral analysis technique (Spitz *et al*, Health Physics 49, 1085-1096, 1985) is applied to calculate the background and identify photopeaks.

The counting system and chamber, along with the necessary liquid nitrogen supply, an office and change rooms, are installed on a three-axle trailer, which serves both the BRR and PHCF facilities (about 630 km apart). BRR workers are routinely lung-counted once per year, while PHCF workers are counted either once or twice per year, depending on the nature of their work and potential for exposures to Type M&S uranium compounds. Due to the nature of activities at BRR and PHCF, workers requiring twice-per-year monitoring are present only at PHCF.

The retention and excretion curves specific to both BRR and PHCF facilities have been determined as a result of an in-vitro dissolution study carried out by the licensee. This workplace characterization, which was done for both BRR and PHCF, allowed for the derivation of work area-specific urinary excretion and lung-retention functions, which are used to convert bioassay monitoring results to dose. This work and the internal dosimetry program were reviewed by CNSC staff and a working group of consultants to the CNSC, prior to receiving regulatory approval.

Q. No 9	Country	Article	Ref. in National Report
	United Kingdom	General	P7, 3.8 & P102, K.4

Question/ Comment: Adaptive phased management is an example of good practice in engaging stakeholders in developing a geologic repository.
(1) Is there an indicative timescale for the adaptive phased management process?
(2) If so, what important milestones have been identified before a geologic disposal facility becomes operational?

Answer: 1) On an indicative basis, NWMO has identified the late 2030s as the earliest possible date for having an operating repository for the long-term management of spent fuel. For financial conservatism, and to ensure that funding will be in place when needed, NWMO has established a funding formula against an assumed date of 2035 for an operating repository.

An important aspect of Canada's Adaptive Phased Management plan is the avoidance of prescribed timelines for the development of the repository. It is difficult to predict the time required to confirm a suitable site, within an informed and willing host community. It is important to take the time required at

each step, to collaboratively plan and confirm major steps in the process with interested individuals and organizations, and through technology demonstration. At each step, technical foundations must be confirmed, the latest research taken into account, and public expectations met for inclusion, collaboration and public involvement in decision-making.

2) While there is no fixed timetable for the in-service date, implementation milestones will assure NWMO's readiness to move forward with site evaluations, feasibility studies and technical and socio-economic assessments, as communities express interest at a future stage.

Adaptive Phased Management will be implemented in phases, marked by explicit decision points, each providing opportunities for input by Canadians, as NWMO works toward an operational repository.

- The phase of work currently underway involves preparation for the site selection process – the collaborative design of the site selection process and advancement of technical and social research to support siting.
- A future phase will involve the start of the site selection process.
- As the suitability of candidate sites is assessed in willing communities, NWMO will conduct detailed site evaluations to confirm the suitability of the sites in terms of technical and scientific feasibility, safety and community well-being.
- Following selection of a preferred site in a willing community, the process of obtaining regulatory approvals will begin.
- A further phase will involve the construction and operation of an underground characterization facility and research laboratory and related facilities to confirm and demonstrate the safety of the repository.
- Licensing and construction of the deep repository will follow, along with the associated surface facilities.
- The next phase will involve operation of the long-term management facilities, with transport of the spent fuel from the interim storage facilities at the nuclear reactor sites to the new central repository site.

NWMO's five-year plan (2009-2013) sets out near-term strategic objectives, guiding the implementation of Adaptive Phased Management. In this document, NWMO identifies a number of milestones to be achieved in the next five years, such as:

- Development and confirmation of the site selection process by 2010.
- Launch of the site selection process after 2009.
- Development of NWMO internal capability to respond to public interest and initiate community evaluations and feasibility studies, by 2011.
- Having, by the end of 2012, the internal capability and state of readiness to begin technical and socio-economic assessment of potential candidate sites, in response to communities expressing interest. NWMO's technical and social research is building the foundation to support implementation.
- Build the relationships with interested Canadians and Aboriginal people,

and involve them in setting future direction.
- Continue to build NWMO as an implementing organization, with a full range of capabilities.
- NWMO will review and adjust plans in response to changes in the external environment, including implications posed by new nuclear builds for the volume and type of spent fuel to be managed.
- NWMO will continue to update total cost estimates for the program and set out annual levels of trust fund deposits.

Q. No 10	Country	Article	Ref. in National Report
	United Kingdom	General	P106, K.5.1
Question/ Comment	The Deep Rock Vault option has the "highest margin of safety and is consistent with best international practice." How has this been demonstrated in the operational phase and, assuming it will not remain open indefinitely, in the period after closure?		
Answer	The quote in the question is from a motion of the Kincardine Council, and refers to the results of a comparison of alternatives for the long-term management of wastes, including continued surface storage at the site and near-surface disposal. The comparison and criteria are documented in the Independent Assessment Study, and are available on the project Web site, www.opg.com/dgr. The repository is not in operation. It is not expected to enter operation until about 2018.		

Q. No 11	Country	Article	Ref. in National Report
	United Kingdom	General	P102-1007, K.4.1 & K.4.2
Question/ Comment	Can Canada please explain its reasoning in developing separate geologic repositories for low and intermediate wastes and for high level wastes including irradiate spent fuel?		
Answer	Canada has a federal law *Nuclear Fuel Waste Act* (NFWA) (2002) dealing specifically with spent fuel. The NFWA requires the nuclear energy corporations, namely Ontario Power, Hydro-Quebec and New Brunswick Power, to form a Nuclear Waste Management Organization. This organization is responsible for implementing the government-selected approach of Adaptive Phased Management, which has as its endpoint a deep geological repository for spent fuel. Canada's Policy Framework for Radioactive Waste (1996) requires the owners of all forms of radioactive waste to be responsible for the safe and secure management of those wastes. Ontario Power Generation has initiated a project to build a facility for the low- and intermediate-level wastes produced by the 20 reactors it currently owns. Based on discussions with the community, a deep geologic repository was selected. Other waste owners are considering options for the long-term management for their low- and intermediate-level wastes.		

Q. No 12	Country	Article	Ref. in National Report
	United Kingdom	General	P107, K.5.2

Question/ Comment	What timescales are envisaged for providing a 'full suite of waste management facilities'?
Answer	A number of waste management facilities, or capabilities will be required to effectively manage the wastes under the Nuclear Legacy Liability Program. These include waste characterization, processing, conditioning, treatment, packaging, storage and, ultimately, a long-term waste management facility for low-level and intermediate-level waste, around 2025.

Q. No 13	Country	Article	Ref. in National Report
	United Kingdom	General	P109, K.5.2.1

Question/ Comment	Good progress has been in remediation of the Glass Block test sites and recovery of the NRX fuel rods from Waste Management Area A at CRL. (1) What was the extent of radioactive contamination of soil and groundwater found at these sites during the recovery process? (2) Has the level of contamination required further clean-up measures?
Answer	The extent of soil contamination associated with the Glass Block removal averaged 1,000 Bq/gm or less, predominately Cs-137 and Sr-90. The brittle nature of the blocks led to the generation of chips and fine dust during the removal process, which resulted in a greater volume of contaminated soil being removed than originally anticipated. Further cleanup was not necessary, because all the contaminated soil was removed. The NRX fuel rods were recovered from Waste Management Area-A (WMA-A). WMA-A was historically a site for direct liquid dispersals. It is, therefore, not possible to distinguish, with any certainty, between the soil or groundwater contamination caused by the fuel rods and the one resulting from the liquid dispersed in the area. Following the removal of the fuel rods and contaminated soil, the gamma radiation fields within the excavated hole measured < 0.01 mSv/h near contact. After the emplacement of topsoil and grass seed, a final radiological survey was conducted, which included all areas impacted by the activities involved in the transfer project - the excavation site, the storage location of waste packages, and the access roads to the excavation site. The radiation fields in these areas were measured and discovered to be within the typical background for the area. AECL intends to complete the retrieval of wastes from WMA-A and associated contamination, as part of the decommissioning activities for the site.

Q. No 14	Country	Article	Ref. in National Report
	United Kingdom	General	P111, K.5.3.1

Question/ Comment	The Port Hope Area Initiative is recognised as an example of good community engagement in developing a solution to long-term radioactive waste management. However, the report does not seem to provide any information on the planned timescale for long-term monitoring or when the facility might be released from institution control. (1) Does this suggest these will continue indefinitely? (2) How does Canada intend to avoid placing a burden on future generations by requiring them to maintain monitoring systems and appropriate institutional

arrangements?

Answer

1) The Port Hope Area Initiative comprises community-based solutions to the historic waste accumulated in the area since the early 1930s. Subject to the applicable regulatory requirements at the time of construction, the citizen committees involved in the development of the solutions recommended a series of site performance objectives, to be used in the development of conceptual designs for the potential storage facility options. The following community-based site performance objectives are of direct relevance to this question: the design period for the storage facility options should be long-term (i.e. hundreds of years); the facility should have minimal on-going maintenance requirements; following construction, a comprehensive long-term environmental monitoring program should be put in place; a long-term funding system should be developed for the care and maintenance of the facility; and the facility should be aesthetically and physically compatible with local area land uses.

2) The design objectives for the long-term waste management facilities for the Port Hope Area Initiative include the full utilization of all areas of the facility, whether for active or passive recreational use and future site usages that will maintain or enhance property values at or near the site. It was not the intention of the community to isolate and restrict access to the management sites. The citizen committees recognized that these sites should be integrated into the community, whether for active or passive recreational uses, and that, through such usage, the institutional nature of the site could be more easily maintained. The history behind the site would not be forgotten.

Q. No 15	Country	Article	Ref. in National Report
	United Kingdom	General	P136, Annex 4 4.2

Question/ Comment

(1) What are quality assurance arrangements are applied to underwater repairs in the wet storage bays?
(2) What is the expected lifetime of the repairs?
(3) What evidence is there to support the claimed lifetime?

Answer

a) The quality assurance applied for the repairs follows the Canadian Standard Association (CSA) Z299.2 "Quality Assurance Program - Category 2'.

Updated with info from OPG

b) There is not a specific lifetime of the epoxy associated with this type of repairs. It becomes part of regular inspections and maintenance.

c) A repair program with quality control inspections was carried out to reduce the leakage from the wet storage bay. Post-repair leak measurements were also conducted to assess the effectiveness of the repairs.

Q. No 16	Country	Article	Ref. in National Report
	United Kingdom	General	P155, Annex 5 5.1.7.1.1

Question/ Comment

Groundwater monitoring around Waste Management Area A has shown stable and improving conditions.
Are there any long-term public safety or environmental implications arising from disposal of long-lived radionuclides in the mixed fission products?

Answer — Waste Management Area-A (WMA-A) is not considered to be disposal, but rather interim storage. Plans are in place for the retrieval of wastes and associated contamination from WMA-A and other legacy waste areas at Chalk River Laboratories (CRL). The retrieval will take into consideration the potential risks to the public, workers and the environment (non-human biota), and will also account for factors such as long-term institutional controls for the CRL Site. All the waste retrieval work is subject to detailed planning and safety assessment that is directed at protecting the workers and environment during the waste retrieval, characterization and packaging/processing that may be required. Strontium-90 (Sr-90) is a relatively mobile fission product radionuclide, which has migrated down gradient from WMA-A. A study is currently underway, to determine the best method to intercept and remove Sr-90 from this plume.

Q. No 17	Country	Article	Ref. in National Report
	United Kingdom	General	P163, Annex 5 5.1.9

Question/ Comment — (1) Can you please explain what are the 'strict release guidelines'?
(2) Who sets these?

Answer — By adding "strict release guidelines" to the program description, Cameco is trying to convey the view that, for all practicable purposes, any materials which are deemed suitable for release from licensed Canadian uranium processing sites must essentially meet the acceptance criteria of the recipient. When transferring materials to recipients outside the nuclear sector, acceptance criteria are typically based on comparisons to the normal range of background radiation levels, or comparative radionuclide content in related materials, or through regulatory accepted controlled releases, supported by case-specific pathways analysis. For instance, steel mills typically use portal monitors to detect and reject material having above-background levels of radioactivity. In other instances, the base reference for release of materials (such as soil) or generated substances (such as sludges or by-product fertilizers) is derived from values which include the natural range of uranium content in soils or in other fertilizers.

Uniform, across the board formal limits, for the release of materials from uranium processing facilities to non-nuclear sectors have not been established in Canada. Rather, the approach is one of regulatory accepted criteria for specific sites, or case-specific release criteria, allowing for conditional clearances.

Q. No 18	Country	Article	Ref. in National Report
	United Kingdom	General	P163, Annex 5 5.1.9

Question/ Comment — (1) Is there an active programme looking at either recycling methods or disposal routes?
(2) If not, how long is it expected that materials will remain in storage?

Answer — There is an active program, which has been in place for many years, looking at the recycle methods and disposal routes for Cameco uranium processing site wastes. Back in the 1970's, major changes in the overall waste management strategy became necessary, caused by the limited remaining storage capacity for low-level radioactive wastes from facilities in Port Hope, coupled with environmental issues associated with the existing facilities of that time, the

overall concern caused by the historic wastes in the Port Hope area, as well as the unacceptability continuation of simple landfill burial for the types of wastes generated by uranium processing facilities. Most notably within the refinery and conversion plants, major efforts were put into developing uranium processing waste management practices. Specifically, these include:

- Integration of chemical recycle processes into plant processes, to minimize waste generation within these processes (such as enhanced nitric acid and HF recovery);
- Efforts - not always successful - to manufacture usable commercial byproducts (such as ammonium nitrate fertilizer, steel grinding balls for mine site milling operations, and a calcium fluoride slag agent for steel manufacturers);
- Upgrades to and recycle of former waste streams (solvent extraction and raffinate recycle - first as a liquid product, to recover its uranium and sulphuric acid content, then as a calcined product focused solely on its uranium content - as well as reuse of uranium ore concentrate drums); and,
- Much tighter control of incidental waste generation through waste minimization, segregation, incineration, and clean-up of materials (to maximize recycle/disposal of clean materials, and minimize low-level radioactive waste (LLRW) storage and disposal requirements.)

The resulting waste management strategy forged by Cameco from its activity in the late 1970's and early 1980's could be summarized as follows:

- Minimize contaminated waste generation rates;
- Maintain producer accountability;
- Be guided by the following sequence of priorities
  - Avoid contamination above background levels
  - Recycle within the plant (or facility) generating the waste
  - Recycle within the nuclear fuel cycle, with preference given to Cameco-operated facilities
  - Well-controlled recycling, or disposal outside of the nuclear fuel cycle as non-LLRW material
  - Commercial disposal as LLRW, to the extent that such facilities exist.

Cameco's Port Hope and Blind River fuel processing facilities have operated for over 20 years without ready access to commercial LLRW disposal facilities. Recycle and recovery processes internal to the plant and within the fuel cycle, coupled with efforts to clean material for unrestricted release, have been the prime waste management tools for the past two decades. For the foreseeable future, the current approach is expected to continue, seeking improved efficiency in recycling and developing more efficient and economic clean-up

approaches. New opportunities continue to develop for specific wastes.

However, there remains a small, but slowly increasing inventory of on-site waste materials which cannot be economically recycled or free-released. The amount continues to remain manageable, based on experience over the last 20 years. Unless new waste processing methods are discovered, the plan for these materials is to aggregate them with decommissioning wastes, at the end of the life of the facility.

Q. No 19	Country	Article	Ref. in National Report
	United Kingdom	General	P197, Annex 8 8.2.1.2 & 8.2.1.3

Question/ Comment: When is the federal government review of its waste management strategy likely to be completed?

Answer: The strategy for managing the historic waste in the storage cells at Fort McMurray, Alberta and Fort Smith, Northwest Territories, is not currently under review. The text referred to in the question relates to changes in CNSC's approach to licensing exemption criteria, as proposed at the time the text was being prepared.

The CNSC is currently assessing the materials in all of the consolidated mounds against the release criteria from the revised *Nuclear Substances and Radiation Devices Regulations* (revised: April 18, 2008). Exemptions from current licensing may not be required, if the contamination in the materials is deemed to be below regulatory concern. A decision will be made before the current exemption expires, on December 31, 2009. This does not absolve the federal government of future liabilities associated with these wastes (where applicable), but does remove them from CNSC regulatory control, based on a lack of radiological health and safety concerns.

Q. No 20	Country	Article	Ref. in National Report
	Ireland	Article 3	C4 Naturally occurring radioactive mater

Question/ Comment: The report states that "only non-exempt naturally occurring radioactive (materials) are discussed in this report, namely radium bearing wastes resulting from the former radium industry, and tailings and waste rock from uranium mines and mills". Could Canada explain the basis for exempting other NORM waste?

Answer: "Naturally occurring nuclear substances (NONs), other than those that are or have been associated with the development, production or use of nuclear energy, are exempt from the applicable of all provisions of the *Nuclear Safety and Control Act* (NSCA) and the regulations made under the NSCA except the following:

(a) the provisions that govern the transport of nuclear substances (*Packaging & Transport of Nuclear Substances Regulations)*; and

(b) in the case of a nuclear substance listed in the schedule to the Nuclear Non-proliferation Import and Export Control Regulations, the provisions that

govern the import and export of nuclear substances."

At the federal level, Canada only regulates wastes resulting from activities within the nuclear cycle. Other wastes, which may or may not have a radioactive component, are regulated by the provincial authorities as hazardous wastes. This has evolved from the fact that the Government of Canada assumes authority over the use of nuclear materials, while the provincial governments generally assume authority over the use of conventional materials.

Q. No 21	Country	Article	Ref. in National Report
	Finland	Article 4	K.4.2

Question/ Comment: In your report, in Section K.4.2, when decribing the APM approach to long-term management of spent fuel, it is stated that the techincal method is such that the spent fuel can be retrieved 'over a long period , until such time as a future society makes a determination on the final closure and the appropriate form and duration of post-closure monitoring'.What is meant by 'long period' and what is your view on the risks (for long term and operational safety) of keeping a repository open for a 'long period'?

Answer: After the spent fuel has been repacked into long-lived spent fuel containers and placed in the deep geological repository, APM allows for a period of monitoring over an extended period of time, without affecting the integrity of the containment and isolation system. Monitoring would be done primarily to confirm the safety and performance of the repository system and to support various decisions. Monitoring will occur (1) before spent fuel container placement, (2) during spent fuel container placement and (3) after spent fuel container placement.

The NWMO does not know the duration of this period of extended monitoring, after the spent fuel container is placed in the repository. This will be a future decision - to be made by the society, government institutions and processes of the day. However, NWMO believes that it would be possible to continue in-situ monitoring of the repository for many decades, without compromising the engineered barrier system or the near-term operational safety and long-term public safety of the repository.

Q. No 22	Country	Article	Ref. in National Report
	Germany	Article 4	p. 71; Sec. G.7

Question/ Comment: Section G.7.1 lists the requirements for the spent fuel storage without mentioning timeframes. As storage for many years may be needed – are there specific requirements how long containers need to provide safety?

Answer: The requirement for the safety of spent fuel containers rest with the licensee. Throughout its operating life, the containers are monitored and maintained to ensure its structural integrity thereby providing for the protection of the public, workers and the environment. Although the design life was 50 years, it is recognized that some containers may have a shorter or longer operating life. The structural integrity of the spent fuel containers are assessed and should the structural integrity be compromised, the spent fuel can then be transferred to a

new spent fuel container.

Q. No 23	Country	Article	Ref. in National Report
	Hungary	Article 4	G.17 p.80
Question/ Comment	The new adaptive phase management – recommended by NWMO – assumes the retrievability of the used fuel: What are the arguments for such a decision?		
Answer	During NWMO's initial public consultation, one of the common comments received was that method chosen allow the waste to be monitored continuously and to be retrieved if necessary for many years into the future. APM enables spent fuel to be retrievable throughout all phases of implementation. The deep geological repository for spent fuel has been developed at the conceptual level to allow for the potential retrieval of fuel, for safety or other reasons. Any features designed to facilitate the retrieval of spent fuel will not compromise the ultimate safety of the deep geological repository. The technology to retrieve spent fuel containers has been developed and demonstrated at the surface and in underground research laboratories.		

Q. No 24	Country	Article	Ref. in National Report
	United States of America	Article 4	Section G.17, Page 80-81
Question/ Comment	a) Please describe how NRCan and CNSC will coordinate their respective oversight responsibilities for NWMO's management and regulatory activities. b) Please describe NRCan's enforcement capabilities for lapses in NWMO management. c) Please address these points during your national presentation in May 2009.		
Answer	a) Two key pieces of legislation govern the long-term management of spent fuel in Canada — the *Nuclear Fuel Waste Act* (NFWA) and the *Nuclear Safety and Control Act* (NSCA). The NFWA, administered by the Minister of Natural Resources, established the Nuclear Waste Management Organization (NWMO) and gave it the mandate to manage Canada's spent fuel over the long-term. Under the NFWA, the NWMO has a legal obligation to report on its activities to the Minister on an annual basis. Pursuant to the NFWA, the Minister is responsible for ensuring that the NWMO makes progress on implementing the Adaptive Phased Management approach, for managing spent fuel over the long-term. The Minister also ensures that waste owners set aside sufficient funds to pay for the construction, operation and maintenance of a long-term waste facility. The department of Natural Resources Canada (NRCan) provides support to the Minister by monitoring, reviewing and overseeing the NWMO's activities related to implementation of the Adaptive Phased Management approach. The Canadian Nuclear Safety Commission (CNSC), which is the Government of Canada's independent nuclear regulatory agency, regulates the management of spent fuel and radioactive waste to protect the health and safety of the public and the environment.		

In regards to coordination, NRCan and the CNSC have separate and distinct oversight responsibilities under the NFWA and the NSCA, respectively. Keeping this in mind, officials within NRCan and the CNSC have developed a good working relationship, and meet to discuss issues that are relevant to the long-term management of nuclear fuel waste. Both NRCan and the CNSC will continue to cooperate as the NWMO begins its siting process to find a suitable site in an informed and willing host community. As the licensing agency, the CNSC's role will increase as siting process proceeds and a licence application has been submitted.

b) Pursuant to the NFWA, the NWMO may not withdraw monies from the NFWA trust funds before a licence has been granted by the CNSC. Any deviation from this, the Minister may require her approval for future withdrawals.

In the meantime, the NFWA imposes a set of reporting obligations (such as annual reports, triennial reports and audited, annual financial statements) that the NWMO must respect. The Minister has the authority to audit and inspect the records and books of the NWMO and nuclear energy corporations.

The government has other approaches at its disposal for enforcing the NWMO to comply with legislation. The Minister can formally speak to the NWMO regarding any concerns, and may also make public these concerns and request changes when necessary. Ultimately, the obligations placed on the NWMO by the NFWA are enforceable in a court of law, and failure to comply with the legislation could result in the government taking action through the court system, which might impose financial penalties.

c) Yes, Canada would be pleased to address these points in its national presentation at the Joint Convention Review Meeting.

Q. No 25	Country	Article	Ref. in National Report
	Romania	Article 5	Section G6, page 70

Question/ Comment: According to the report, "The engineered structures, canisters, MACSTOR and OPG dry storage containers were originally designed for a 50- year lifetime. The actual life of the structures could be much longer. These structures are vigorously monitored; in the event of a structure failure, the spent fuel can be retrieved and transferred to a new structure."

a) Please provide us more information on the decision to prolong the life of MACSTOR dry storage containers.
b) How will influence this decision the long term strategy for the management of the spent nuclear fuel?

Answer:

a) There is no decision to prolong life at this time. The MACSTOR dry storage containers were designed with a nominal design life of 50 years. Throughout its operating life, the containers are monitored and maintained to ensure its structural integrity thereby providing for the protection of the

public, workers and the environment. Although the design life was 50 years, it is recognized that some containers may have a shorter or longer operating life. Should the integrity be compromised, the spent fuel may be transferred to a new storage container. The monitoring and maintenance programs for the dry storage containers are continuously under review and may require updating as the design life is approached or exceeded.

b) The potential for the life extension of dry storage containers does not influence the long-term strategy for the management of spent fuel; rather, any delay in the availability of the Nuclear Waste Management Organization (NWMO) long-term fuel management facility would require an assessment of the possibility of extending the life of the containers until the fuel could be transferred to the NWMO facility.

Q. No 26	Country	Article	Ref. in National Report
	Ukraine	Article 5	G.17 , page 79

Question/ Comment: Does Canada really plan to deposit CANDU spent fuel to the Deep Geologic Repository without reprocessing in order to extract valuable materials and decrease volume?

Answer: The Nuclear Waste Management Organization (NWMO) has studied reprocessing of spent CANDU fuel, and concluded that reprocessing is highly unlikely in Canada at this time. The reprocessing of spent fuel is a decision that would be made by the waste owners in Canada, not the NWMO. Nevertheless, NWMO continues to maintain a "watching brief" on reprocessing and its potential implications on long-term management, and publishes annual reports on this technology on its Web site, www.nwmo.ca.

Q. No 27	Country	Article	Ref. in National Report
	Germany	Article 6	p. 74; Sec. G.10.1

Question/ Comment: It is a regulatory requirement for licence applicants and licensed operators of Class I nuclear facilities and uranium mines and mills to launch public information programmes about their activities.

a) In which manner are the notifications on incidents or failures at nuclear facilities, as well as their causes and the measures to prevent recurrence, being released to the public?

As the feedback of operational experiences may also be of great value for other countries, they would probably appreciate to receive such information.

b) Does the Canadian Nuclear Safety Commission (CNSC) prepare any regular reports on safety-related incidents in spent fuel storage facilities and radioactive waste management facilities which are available to the public?

Answer: a) Licensees are required by paragraph 3(j) of the *Class I Nuclear Facilities Regulations*, and sub-paragraphs 3(c) (i) and paragraph 8(a) of the *Uranium Mines and Mills Regulations*, to have public information programs that inform persons living in the vicinity of the general nature and characteristics of the anticipated effects on the environment and the health and safety of persons, which may result from a nuclear facility. The licensee is provided guidance on the CNSC's expectations for such a program through regulatory guide G-217, *Licensee Public Information Programs*. Licensees are encouraged to employ

multiple communications approaches, and are expected to use the most applicable approaches to their communities. This often includes regular participation in local government forums and committees, distribution of periodic newletters, and presentations at local public events.

b) Depending on the significance of the incident, the CNSC prepares "Significant Development Reports" (SDR), submitted to the Commission as a public document. The latter is presented to the Commission at a scheduled public meeting. The public meetings of the Commission are open to the public, and may be attended in person or watched via webcast at www.nuclearsafety.gc.ca. Transcripts and minutes of the meetings and archived copies of the most recent webcasts are available to the public through the CNSC's Web site. Copies of the commission member documents providing the written SDR are also available to the public, upon request.

Q. No 28	Country	Article	Ref. in National Report
	United States of America	Article 6	Section Executive Summary 3.1(b), Page 3
Question/ Comment	Please update on the status of the public review of the NWMO five-year plan, siting process proposal document, for the spent fuel management facility during your national presentation in May 2009.		
Answer	NWMO would be pleased to provide an update on the status of the public review of its five-year plan and the siting process proposal, at the May 2009 presentation. The public review of the NWMO's first five-year plan was completed in Spring 2008. A summary of the comments received on the Plan are available on the NWMO Web site, www.nwmo.ca , under "Implementing APM", and the headline "What we heard from engagement activities". Based on the received input, the Implementation Plan (2008-2012) was revised and published in June 2008. Since that time, a 2009-2013 Plan has been published, with an update on planned activities. The collaborative development of the siting process proposal began in Fall 2008, with the publication of a discussion document and engaging dialogues with interested Canadians on the key principles and elements for the site selection process. These dialogue reports are published on NWMO's Web site. With the input received, NWMO is now proceeding to prepare a *Draft Proposal for a Site Selection Process,* for a further round of public review and comment, before the process is confirmed.		

Q. No 29	Country	Article	Ref. in National Report
	United States of America	Article 6	Section G.17, Page 80
Question/ Comment	The report states that a "willing community will be sought" to host the spent fuel disposal facility.		

a) Please describe the public process to identify this "willing community."
b) What alternatives are being considered in the absence of finding this "willing community"?
c) Please address this during your national presentation in May 2009.

Answer

a) The public process to identify a willing community is presently under development. NWMO is developing the site selection process through a collaborative initiative with interested organizations and individuals. During the 2008 dialogues, these organizations and individuals provided their expectations for key principles and elements of a site selection process. With this input, NWMO is preparing a *Draft Proposal for A Site Selection Process*. This Draft process will be released for public review and discussion, from Spring through Fall 2009. By 2010, NWMO anticipates having finalized the site selection process.

b) NWMO is not considering an alternative to a willing host community. The host community for the repository must be informed and demonstrate that it is willing to accept the project. It is important to take as much time as necessary, in order for potentially interested communities to develop an understanding of the project and how they may be impacted by it. NWMO will take the time required to work with communities to identify an informed, willing host for the facilities, and has no deadline by which it must identify a site and host community. In the meanwhile, the spent fuel is safely stored at licensed interim storage facilities at the reactor sites in Canada, and can remain safely stored there for many decades.

c) NWMO is planning to publicly release its *Draft Proposal for A Site Selection Process* by early May 2009. NWMO would be pleased to speak about this process during the Canada's national presentation at the Joint Convention.

Q. No 30	Country	Article	Ref. in National Report
	Hungary	Article 7	G.4.1 p.70

Question/ Comment: What way will the Zero Energy Deuterium-2 spent fuel be managed?

Answer: The ZED-2 spent fuel will be managed in the same manner as AECL's other research reactor fuel. Spent fuel is initially stored in the water pool bays, until its radioactivity and heat output have decreased sufficiently for dry storage. The spent fuel is then placed in containers and transferred to Waste Management Area-B, for storage until a national long-term spent fuel management facility becomes available.

Q. No 31	Country	Article	Ref. in National Report
	Korea, Republic of	Article 7	p.139 (Annex 4)

Question/ Comment: In the Annex 4 of the report, Figure 4.4 shows an indoor dry storage of spent fuel and Figures 4.8 and 4.9 show dry storage canisters installed outdoor.

What are specific regulatory requirements relevant to spent fuel dry storage casks/canisters at indoor and outdoor, respectively?

Answer

It should be noted that the dry storage containers (DSC), currently stored indoors by OPG, were designed and initially assessed for outdoor storage. For operational reasons, OPG subsequently took the decision to place the DSCs within storage buildings.

Therefore, the CNSC does not identify different regulatory requirements in the areas of safety or security for the indoor or outdoor interim dry storage of spent fuel. The dry storage safety philosophy in Canada embodies the "defence-in-depth" approach, to keep radionuclide emissions below regulatory limits and As Low As Reasonably Achievable (ALARA). This defence-in-depth approach is represented by multiple barriers between the spent fuel (or radioactive waste) and the public. Each barrier independently provides a measure of safety towards preventing the release of radioactive materials. In the case of spent fuel, the barriers are as follows:

- the uranium dioxide matrix, which effectively contains the radionuclides present in cooled used fuel, except for the free fractional inventory of tritium (in vapour form) and krypton-85 (which is a gas);
- the fuel cladding, which additionally contains the free fractional inventory of tritium and krypton-85 that would otherwise be available for release;
- the seal-welded container, provides an additional barrier against the release of tritium and krypton-85 in the event of fuel cladding failure; and
- the reinforced concrete of the containers (base, lid and concrete walls), which provides effective shielding for gamma radiation from used fuel.

The regulatory body, the CNSC, does not prescribe a minimal number of barriers to be used. The proponent must demonstrate, through the use of the multiple-barrier-concept, that the health, safety, security and the environment are adequately protected during both normal and abnormal conditions. The storage design must be capable of being monitored to verify its containment. The proponent is also required to provide a safety assessment, conservatively estimating the doses to workers and the public from postulated failures of fuel elements and storage containers, for normal and abnormal operating conditions as well as credible accident conditions. Conservative estimates of public dose rates due to releases resulting from the hypothetical failure of an assumed fraction of fuel elements are also considered. Bounding (worst-case) accident scenarios are conservatively identified even if they are unlikely to occur, and the results of off-site dose consequence calculations are then compared against the regulatory annual dose limit.

The proponent must also demonstrate that the containers are performing as designed. An inspection and maintenance program of the containers, approved by the CNSC, must be designed and implemented by the proponent, in order to demonstrate the continued integrity of the containers and containment of the

radionuclides.

Q. No 32	Country	Article	Ref. in National Report
	United States of America	Article 7	Section Executive Summary 3.5, Page 6

Question/ Comment
a) Please update during your national presentation in May 2009 the status of the Fuel Packaging and Storage Project.
b) Where will this facility be sited?
c) Has a construction approval application been submitted?

Answer
a) Canada would be pleased to provide an update on the Fuel Packaging and Storage Project in its national presentation to the Joint Convention.
b) The Fuel Packaging and Storage (FPS) facility will be located on the CRL site adjacent to the Waste Management Areas.
c) A construction approval application for the FPS project has been submitted to the CNSC on December 12, 2008.

Q. No 33	Country	Article	Ref. in National Report
	Russian Federation	Article 9	G.12, p. 76H.9, p. 90

Question/ Comment
a) Does a license to operate also require a licensee to keep records on occupational exposure doses?
b) How long such records should be stored?

Answer
a) Yes, the *Radiation and Protection Regulations* requires the licensee to keep records of occupational exposure.
b) Section 27 of the *Nuclear Safety and Control Act* (NSCA) states that every licensee shall keep the prescribed records, including "a record of the dose of radiation received by or committed to each person who performs duties in connection with any activity that is authorized by this Act, or who is present at a place where that activity is carried on"; licensees must retain those records for the prescribed time and disclose them under the prescribed circumstances.

Section 28 of the *General Nuclear Safety and Control Regulations* states that "every person who is required to keep a record by the Act, the regulations made under the Act or a licence shall retain the record for the period specified in the applicable regulations made under the Act or, if no period is specified in the regulations, for the period ending one year after the expiry of the licence that authorizes the activity in respect of which the records are kept. No person shall dispose of a record referred to in the Act, the regulations made under the Act or a licence, unless the person is no longer required to keep the record by the Act, the regulations made under the Act or the licence; and has notified the Commission of the date of disposal and of the nature of the record at least 90 days before the date of disposal."

Q. No 34	Country	Article	Ref. in National Report
	China	Article 10	Section G.17,p.80

Question/ Comment
a) Please provide further information on NUMO's functional and organizational structure.

b) In Canada, how do NRCan and other relevant governmental agencies regulate the NNMO's activities?

Answer

a) NWMO is the implementing agency, responsible for designing and implementing Adaptive Phased Management, Canada's approach for the long-term management of spent fuel.

Established to operate - on a not-for-profit basis - by Canada's major spent fuel owners, the NWMO's mission is to develop and implement collaboratively with Canadians the management approach for the long-term care of Canada's spent fuel, in a manner that is socially acceptable, technically sound, environmentally responsible and economically feasible.

NWMO operates with a multi-disciplinary team, with a focus on integration of social and technical contributions. For example, the development of the site selection process is a collaborative initiative led by a joint social/technical team. Similarly, public engagement is conducted through an integrated team of technical and social research/engagement staff.

Social Research Program: Social Research supports NWMO's ongoing dialogue and collaboration activities, including work to engage potentially affected citizens and interested organizations, visioning of the implementation process and the development of decision-making processes. NWMO learns from the experiences of others, exploring the perspectives of citizens and specialists on key issues. Citizen panels, focus groups, public attitude surveys, as well as the commissioning of social research papers and designing of NWMO's engagement programs are among the activities of this group.

Public Engagement and Communications: NWMO is building long-term relationships to develop awareness, understanding and support for Adaptive Phased Management. The success of Canada's approach for the long-term care of spent fuel is dependent on the involvement of interested Canadians, organizations and Aboriginal people in key decisions, through open, transparent and inclusive engagement processes. Engagement team members work closely with municipal/community organizations, NGOs and Aboriginal Elders groups. The Communications department handles media relations, coordinates government relations and oversees corporate internal and external communications.

Liability Management: NWMO is responsible for ensuring that the cost estimates for Adaptive Phased Management remain updated, and that the funding formula to pay for the plan collects and protects enough money to ensure that its entire costs are covered under a variety of social and

economic circumstances, and within the required timeframe.

Technical Research Program: Technical Research is focused on developing engineering designs for a deep geological repository, advancing geoscience and site characterization methods, and preparing illustrative safety assessments to support development of the siting process. In addition to our in-house staff capabilities, the program benefits from strong working relationships with universities and consultancies, as well as collaboration and participation in joint research, development and demonstration projects internationally.

Corporate: As of January 1, 2009, the NWMO is a stand-alone employer, possessing the entire necessary support infrastructure - including human resources, finance, legal services, quality assurance and administrative support.

As of December 2008, NWMO had 83 staff, growing from 27 staff in 2007. Many of these additions resulted from the transfer of OPG personnel to NWMO, enabling NWMO to acquire the experience base of an established nuclear waste management and repository team.

NWMO's primary mandate is long-term management of Canada's spent fuel. The organization has also entered into a service agreement with OPG, to develop and license OPG's proposed deep geological repository for low- and intermediate-level waste at Kincardine, Ontario, on their behalf. This first-hand experience with a repository project will build NWMO's capacity for implementing Adaptive Phased Management, the repository for spent fuel.

b) Two key pieces of legislation govern the long-term management of spent fuel in Canada — the *Nuclear Fuel Waste Act* (NFWA) and the *Nuclear Safety and Control Act* (NSCA).

The NFWA, administered by the Minister of Natural Resources, established the Nuclear Waste Management Organization (NWMO) and gave it the mandate to manage Canada's spent fuel over the long-term. Under the NFWA, the NWMO has a legal obligation to report on its activities to the Minister on an annual basis. Pursuant to the NFWA, the Minister is responsible for ensuring that the NWMO makes progress on implementing the Adaptive Phased Management approach, for managing spent fuel over the long-term. The Minister also ensures that waste owners set aside sufficient funds to pay for the construction, operation and maintenance of a long-term waste facility. The department of Natural Resources Canada (NRCan) provides support to the Minister by monitoring, reviewing and overseeing the NWMO's activities related to implementation of the Adaptive Phased Management approach.

The Canadian Nuclear Safety Commission (CNSC), which is the Government of

Canada's independent nuclear regulatory agency, regulates the management of spent fuel and radioactive waste to protect the health and safety of the public and the environment.

In regards to coordination, NRCan and the CNSC have separate and distinct oversight responsibilities under the NFWA and the NSCA, respectively. Keeping this in mind, officials within NRCan and the CNSC have developed a good working relationship, and meet to discuss issues that are relevant to the long-term management of nuclear fuel waste. Both NRCan and the CNSC will continue to cooperate as the NWMO begins its siting process to find a suitable site in an informed and willing host community. As the licensing agency, the CNSC's role will increase as siting process proceeds and a licence application has been submitted.

Q. No 35	Country	Article	Ref. in National Report
	France	Article 10	G.1.7 p. 80

Question/ Comment: Could Canada indicate when a decision for final disposal of spent fuel assemblies is expected ?

Answer: The Government of Canada announced its decision in June 2007, selecting Adaptive Phased Management as Canada's plan for the long-term management of spent fuel. The end point of this plan is the permanent storage of spent fuel, in a deep repository inside an appropriate geologic formation. With that decision, NWMO assumes responsibility for implementing the plan.

NWMO has identified the late 2030s as the earliest possible date for having an operating repository for the long-term management of spent fuel. For financial conservatism, and to ensure the funding is in place when needed, NWMO has established a funding formula against an assumed date of 2035 for an operating repository.

An important aspect of Canada's plan, Adaptive Phased Management, is the avoidance of prescribed timelines for development of the repository. It is difficult to predict the time required to confirm a suitable site within an informed, willing host community. It is important to take the time required at each step stage to collaboratively plan and confirm major steps in the process with interested individuals and organizations, and through technology demonstration. At each step, technical foundations must be confirmed, the latest research taken into account, and public expectations met - for inclusion, collaboration and public involvement in decision-making. While there is no fixed timetable for the in-service date, the implementation planning will assure NWMO's readiness to move forward with site evaluations, feasibility studies and technical and socio-economic assessments, as communities express interest at a future stage.

Q. No 36	Country	Article	Ref. in National Report

	Korea, Republic of Article 10	p.76 (G.13.2)
Question/ Comment	Section G.13.2 states that OPG-type dry storage containers, leak tightness is verified through helium leak testing before containers are placed in storage and subsequent aging management activities provide assurance that the container condition and weld integrity are not compromised, and helium cannot leak out. 1. Are any aging management programs for non-steel barrier such as concrete barrier of AECL-type concrete canisters and MACSTOR being adopted? 2. If so, please explain more details about the aging management programs for the AECL-type concrete canisters and MACSTOR. 3. What are the major items of routine inspection and/or testing for dry storage facilities (e.g. AECL-type concrete canisters, MACSTOR) performed by the operator?	
Answer	**AECL-type concrete canisters:** The concrete is for structural and radiation shielding only. Leak tightness is achieved by placing the fuel bundles in sealed stainless steel baskets, which are inserted within a steel liner inside the concrete canister. The inner liner is also sealed after the canister is filled. Air is routinely sampled from the liner cavity, and monitored for radioactive contamination and excess humidity. Radioactive contamination would indicate a leakage of the fuel baskets, while excess humidity would be an indication of water getting into the canister. The exterior surfaces of the canisters are routinely inspected for visible signs of deterioration, and radiation fields are monitored, to determine if there is any evidence of shielding deterioration. This is typically done on a quarterly basis. Canisters have been in use at Whiteshell (WL) for over 30 years and for lesser periods at the other sites (Douglas Point (DP), Gentilly-1 and Chalk River Laboratories). During this time, there has been no visual evidence of deterioration or leakage from the fuel baskets. A Life Management Program for the concrete structures at DP was undertaken in 2004, and included the evaluation of the concrete canisters. The inspection revealed no serious damage, but raised concerns that the moisture, freezing during the winter in cracks, may lead to more severe damage. The adding of a protective coating paint was recommended, in order to keep moisture out of the cracks. This concern was only identified for DP canisters. The study also concluded that the routine inspection of the canisters, as described above, is adequate, as shown by their good condition.	

Q. No 37	Country	Article	Ref. in National Report
	United Kingdom	Article 10	P76, G.13
Question/ Comment	What are the established safety criteria that apply to dry storage facilities as mentioned?		
Answer	The dry storage safety philosophy in Canada embodies the "defence-in-depth"		

approach, to keep radionuclide emissions below regulatory limits and As Low As Reasonably Achievable (ALARA). This defence-in-depth approach is represented by multiple barriers between the spent fuel and the public. Each barrier independently provides a measure of safety towards preventing the release of radioactive materials. In the case of spent fuel, the barriers are as follows:

- the uranium dioxide matrix, which effectively contains the radionuclides present in cooled used fuel, except for the free fractional inventory of tritium (in vapour form) and krypton-85 (which is a gas);
- the fuel cladding, which retains the free fractional inventory of tritium and krypton-85 that would otherwise be available for release;
- the seal-welded container, providing an additional barrier against the release of tritium and krypton-85 in the event of fuel cladding failure; and
- the reinforced concrete of the containers (base, lid and concrete walls), which provides effective shielding for gamma radiation from used fuel.

The regulatory body, the CNSC, does not prescribe a minimal number of barriers to be used. The proponent must demonstrate, through the use of the multiple-barrier-concept, that the health, safety, security and the environment are adequately protected during both normal and abnormal conditions. The storage design must be capable of being monitored to verify its containment. The proponent is also required to provide a safety assessment, conservatively estimating the doses to workers and the public from postulated failures of fuel elements and storage containers, for normal and abnormal operating conditions as well as credible accident conditions. Conservative estimates of public dose rates due to releases resulting from hypothetical failure of an assumed fraction of fuel elements are also considered. Bounding (worst-case) accident scenarios are conservatively identified even if they are unlikely to occur, and the results of off-site dose consequence calculations are then compared against the regulatory annual dose limit.

The proponent must also demonstrate that the containers are performing as designed. An inspection and maintenance program of the containers, approved by the CNSC, must be designed and implemented by the proponent, in order to demonstrate the continued integrity of the containers and containment of the radionuclides.

Q. No 38	Country	Article	Ref. in National Report
	United Kingdom	Article 10	P76, G.13

Question/ Comment: Protection on non-human biota is becoming increasingly important and it is good this is recognised in the monitoring requirements for spent fuel dry storage facilities.
(1) Are there any published reports that provide information on the scientific basis for these standards?
(2) How is compliance with the standards assessed?

Answer 1) Canada has guidelines that are used to calculate and interpret doses to non-human biota. This information was published in 2006, by Environment Canada and Health Canada, with scientific input from the CNSC, in the Priority Substances List 2 Assessment Report "Releases of radionuclides from nuclear facilities (impact on non-human biota)". The report and the implementation of its recommendations by the government of Canada are available at http://www.ec.gc.ca/Substances/ese/eng/psap/final/radionuclides.cfm.

2) For environmental assessment purposes prior to licensing, the CNSC requires licensees to assess proposed activities and releases to the environment in an ecological risk assessment, so as to demonstrate that there will be no significant, adverse effects to non-human biota from releases of radionuclides. Compliance with CNSC expectations is then interpreted through the ongoing examination of extensive effluent and environmental monitoring by licensees, in order to confirm that the facility is operating within the envelope predicted in the assessment. Environmental monitoring programs also include monitoring of radionuclides in the tissues of organisms exposed to key effluent pathways, but there is no routine requirement to explicitly calculate biota doses to demonstrate compliance. Occasionally, special studies are requested to demonstrate compliance where radiation exposure of organisms is difficult to quantify; these special studies may include biological effects monitoring.

Q. No 39	Country	Article	Ref. in National Report
	United Kingdom	Article 10	P77, G.13.4.1 & G.13.4.2

Question/ Comment: Can you please describe what happens to liquids returned to the spent fuel storage bays?

Answer: Liquids returned to the fuel bay are added to the bay water, which is recirculated through the purification loop. The purification loop consists of a filter (which removes particulates) and an anion/cation exchange resin, which removes dissolved contaminants from the bay water.

Q. No 40	Country	Article	Ref. in National Report
	China	Article 11	Section H.3.2,p.84

Question/ Comment: How the tritium containing liquid waste is treated at NPP? Please provide information on tritium discharge limit in NPP effluent.

Answer: The basic approach is to ensure that any tritium releases represent only a small fraction of a calculated allowable dose limit.

Note that in the CANDU situation, very high levels of tritium in a waste stream would be associated with an appreciable amount of heavy water. Typically, one would upgrade (distill) the waste stream for reuse of the heavy water, a practice which would recover the majority of the tritium. Waterborne releases usually contain much lower concentrations of tritium

The following are the waterborne releases for two OPG plants over the last two

years:

PNGS (6 operating units): 2006, 3.3E+14 Bq; 2007, 2.5E+14 Bq
DNGS (4 operating units): 2006, 1.9E+14 Bq; 2007, 3.5E+14 Bq

The maximum public dose from these waterborne emissions is about 1 μSv.

Some tritium also gets into organic liquids such as hydraulic lubrication oils. These liquids are typically incinerated.

Q. No 41	Country	Article	Ref. in National Report
	France	Article 11	H.2 p. 83

Question/ Comment: Could Canada precise if wastes are conditioned to be disposed of (on the basis of pre-established Waste Acceptance Criteria) or if they are systematically re-conditioned before ultimate evacuation towards a disposal facility?

Answer

a) Spent fuel from nuclear power reactors is not reprocessed, and is to be disposed as spent fuel bundles in a deep geologic repository, in long-lived containers. Spent fuel from research reactors may require conditioning, before being placed in this facility.

b) Canada has one project currently underway for the disposal of low and intermediate level waste from Power Reactors: the OPG's deep geologic repository (DGR), at the Bruce nuclear site. The DGR is to be located at a depth of 680 m, in an extremely low permeability limestone formation, overlain by 200 m of extremely low permeability shale. The Waste Acceptance Criteria for this proposed facility do not require a systematic conditioning of the waste, which is consistent with assumptions in the draft Safety Case.

OPG uses waste acceptance criteria for the current practice of interim storage. A draft waste acceptance criteria has also been developed for low- and intermediate-level waste for future disposal.

Because a DGR for low- and intermediate-level waste is the process of being designed and licensed with a target start date of 2017, OPG has in the last few years started to go to "disposal ready" packaging for some of the waste streams.

While plans are not finalized, waste conditioning is not expected for the majority of low- and intermediate-level waste. But it is anticipated that there will be a need to repackage a high percentage of the waste generated from earlier operations prior to disposal.

c) AECL is carrying out pre-project feasibility studies for a geological repository at its Chalk River Laboratories site, for legacy, operational and decommissioning wastes.
A final set of Waste Acceptance Criteria has not yet been established.

Q. No 42	Country	Article	Ref. in National Report
	Russian Federation	Article 11	B.7, p. 16,H.3, p. 84
Question/ Comment	Please, specify which category of radwaste the spent radiation sources and radiation devices belong to?		
Answer	Spent radiation sources and devices would be categorized following the IAEA Categorization of Radioactive Sources, Safety Guide RS-G-1.9. The majority would be in the low-level waste category, however there will be some categorized as intermediate-level waste.		

Q. No 43	Country	Article	Ref. in National Report
	United Kingdom	Article 11	P89, H.7
Question/ Comment	The public information systems described in H.7 and elsewhere appear to be comprehensive and inclusive. (1) Is the effectiveness of public information programmes evaluated? (2) If so, how is this evaluation carried out and what criteria for success are applied? (3) Can Canada please comment on whether or not the level and nature of the public response reflects increased acceptance and awareness of waste management facilities in communities?		
Answer	H.7.1.1 Yes. As part of the delivery of the communication plan for the proposed Deep Geologic Repository (DGR), key initiatives such as public research and stakeholder briefings are entrenched within the plan, to ensure that there are mechanisms providing valuable information about public attitudes towards the effectiveness of DGR public information programs. Criteria for success: A key (and overwhelming) objective of the DGR public information program is to ensure that the proposed DGR for low- and intermediate-level radioactive waste continues to enjoy community support both from the host municipality (Municipality of Kincardine) and the seven other Bruce communities which form the entire Bruce County. Therefore, the levels of local community support and community awareness of the project represent appropriate criteria for evaluating the effectiveness of public information programs. Evaluation Methods of the Effectiveness of Public Information programs: • **Public Attitude Research** – a Community Leader Survey of 27 community leaders - *Community Leader Survey/Scoping Interviews Technical Memorandum for the Deep Geologic Repository Project*		

Environmental Assessment - was done in 2006, to gauge the issues facing the Bruce communities, perspectives on the value of OPG to the communities, and challenges and opportunities regarding the DGR project. Participants were asked to respond to 28 questions related to key issues, the role of OPG in the community and the challenges/opportunities of the DGR project. The results of the survey indicate that "**the level of understanding of technical issues, community issues and other aspects of the DGR project is very high.**" It should also be noted that 85 per cent of respondents, when asked how familiar they were with the DGR said either *Very Familiar* (63 percent) or *Somewhat Familiar* (22.2 percent).

- **More Public Research** is expected to be done in either 2009 or 2010.
- **Independent Polling of residents** – Following an extensive public information program about the proposed DGR during 2004, an independent polling of Kincardine permanent and seasonal residents was done early in 2005, to gauge public support for the DGR. The telephone polling, conducted by The Strategic Counsel, concluded that 60 percent of the residents (72 participation rate) polled favoured going forward with the DGR, while 22 percent were opposed, with 13 percent remaining neutral and 5 percent either unsure or refusing to answer.
- **Regular briefings** take place throughout the year (as laid out and defined in the *DGR Communication Plan Document*) with established community advisory committees, government officials, media and community leaders from all sectors. These briefings provide consistent feedback to NWMO on the effectiveness of DGR public information programmes, in relation to public awareness and acceptance of the DGR.
- **First Nations** – a protocol with the Saugeen Ojibway Nation has been signed to facilitate a mechanism for feedback to NWMO from SON, with respect to the proposed DGR project.

There is strong evidence from public research and ongoing public dialogue to suggest that Bruce is an informed community, whose solid support for the proposed DGR project is indicative of increased acceptance and obvious awareness of waste management facilities within the community. However, as one moves away from Bruce County (where there has and continues to be a strong emphasis on DGR public information programs), there is obviously less awareness of the project, and the question is mired by emotions that range from discomfort and uneasiness to strong opposition.

Q. No 44	Country	Article	Ref. in National Report
	United Kingdom	Article 11	P91, H.10.1
Question/ Comment	Regulatory body requirements - given that societal instability can occur over long time periods, how does Canada propose to maintain the technical capabilities, human resources and funding basis to enable CNSC (or its successors) to maintain a perpetual licence?		

Answer — Although it is understood that one cannot predict the future, the evolution or degradation of society, or protect against long-term societal instability, it is important to safeguard and maintain technical capabilities when considering issues of long-term licensing and administrative oversight.

Consequently, it is imperative to have a developed and robust government, one which recognizes the hazards and the safety issues associated with the long-term management of nuclear substances. It is important that this government should develop a strong regulatory body, to oversee the industry in order to protect society from hazards. Such a regulatory body must be technically competent, removed from government and politics, and clearly focused on nuclear safety. It should rely on clear, strong and independent legislation, which provides its authority to maintain its presence, its need for funding, and human resources. Canada has such a regulatory body, the CNSC, and proposes to maintain it in accordance with its governing legislation, the Nuclear Safety and Control Act.

Q. No 45	Country	Article	Ref. in National Report
	United States of America	Article 11	Section H.3.1, Page 84

Question/Comment — Please update during your national presentation in May 2009 the status of the relocation of the Port Granby wastes and the Port Hope licensing.

Answer — Yes, Canada would be pleased to provide an update in its national presentation at the Joint Convention.

Q. No 46	Country	Article	Ref. in National Report
	Romania	Article 12	Section H, page 84

Question/Comment — a) Is it characterized the stored electricity generated waste? b) If no, are there any plans to characterize the stored waste? c) If yes, could you provide more details on characterization methods (both non-destructive and destructive methods)?

Answer — OPG has been doing some waste characterization on various low- and intermediate-waste streams since the 1960's. The main focus, in the early years, was on the determination of radionuclides which mainly affected occupational radiation dose at the generating sites and at the interim waste storage site. In the 1990's, there was a shift in the program, expanding this work towards the longer-lived radionuclides that would be important in a disposal scenario. Much of the waste characterization work in the last fifteen years has focused on the development of scaling factors, in order to estimate the inventories of hard-to-measure radionuclides in strong gamma emitters.

There have been a few surveys over the years, concerning the non-radiological properties of the various waste streams.

Both radiological and non-radiological waste properties for different waste streams and packages are now stored in an Integrated Waste Tracking System

database (IWTS). IWTS is a customized version of a U.S. Department of Energy database, adapted for the OPG situation.

Q. No 47	Country	Article	Ref. in National Report
	Romania	Article 12	Section H, page 84
Question/ Comment	Could you provide detailed information on recent advances in the management of CANDU's ion exchange resins used for cleanup of the reactor moderator and ion exchange resins used for cleanup of the primary coolant?		
Answer	OPG continues to use mixed resin beds in both the HTS and moderator system. There are no new ion exchange resins being tested for these systems, at this time. There are new resins tested elsewhere in the industry, for a better removal of colloidal activity in the heat transport system coolant. Significant amounts of activation products, notably Co-60 (a major worker dose contributor), are apparently present in colloidal form in the coolant, and cannot easily be removed by the conventional ion exchange resins (gel type organic mix bed). These resins are similar in physical and chemical properties to those of conventional nuclear grade resins.		

Q. No 48	Country	Article	Ref. in National Report
	Romania	Article 12	Section H, page 84
Question/ Comment	Is there any strategy for the management of very low level waste resulted from operation and decommissioning of commercial reactors?		
Answer	Canada does not have a preferred long-term management approach for very low level waste from operation and decommissioning of commercial reactors. However, as noted in section K.5, OPG is pursuing the development of a deep geological repository for the long-term management of the low- and intermediate-level wastes from the operation and refurbishment of the OPG-owned reactors in Ontario. Options under study by AECL for the legacy waste at its sites include a geological facility for low- and intermediate-level wastes.		

Q. No 49	Country	Article	Ref. in National Report
	Romania	Article 12	Section H, page 84
Question/ Comment	Please provide us more information on storage technologies for pressure tubes that will arise from future refurbishment activities of CANDU's reactors.		
Answer	The pressure tubes removed from the reactor are reduced in volume - via compression and shearing - prior to packaging in the waste containers. A pressure tube waste container is rectilinear in shape, and constructed of heavy concrete, lined internally and externally with stainless steel. The overall dimensions of the waste container is 1.85m x 1.85m x 2.28m (height). The pressure tube waste containers are stacked as intermediate level waste, in a storage building provided with ventilation, lighting and drainage services.		

Q. No 50	Country	Article	Ref. in National Report
	Romania	Article 12	Section H, page 84
Question/ Comment	Are there any R & D programs to decontaminate large component wastes, such as heat exchangers and steam generators? If yes, what kinds of R&D activities		

	are being conducted?		
Answer	While there has been some utility R&D in this area in the past, this service is now seen as being commercially available through selected outside vendors, typically outside of Canada.		

Q. No 51	Country	Article	Ref. in National Report
	Romania	Article 12	Section H, page 86
Question/ Comment	Is there any long term strategy for the minimization of radioactive waste resulted form operation and decommissioning of commercial reactors? If yes, please provide us more information		
Answer	There are ongoing programs to reduce the volume of radioactive waste. But the basic approach can be simplified as benchmarking our performance against different utilities and adopting best industry practices. Some of the main steps are outlined in Section H.4. These represent small incremental improvements, rather than a dramatic change. But over the past few years, by being more pro-active, OPG has seen small declines in the volumes of waste that are received for interim storage.		

Q. No 52	Country	Article	Ref. in National Report
	Japan	Article 15	H(P87-P93)
Question/ Comment	Please explain reasons for determination of a timeframe for safety assessment of waste disposal, if any.		
Answer	According to CNSC Regulatory Guide G-320, the regulatory body expects the applicant to use a structured approach to assess the long-term performance of a waste management system. Although long term assessments are done with different levels of detail and rigor for different purposes, the overall methodology for performing them should include the following elements: i) selection of the appropriate methodology ii) assessment context iii) system description iv) timeframes v) assessment scenarios, and vi) development of assessment models. According to the *Nuclear Safety and Control Act*, there is no time limit associated with the statutory objective to "prevent unreasonable risk, to the environment and to the health and safety of persons[…]" Future impact assessments of the radioactive wastes are expected to include the period of time during which the maximum impact is predicted to occur.		

Q. No 53	Country	Article	Ref. in National Report
	Japan	Article 15	H(P87-P93)
Question/ Comment	How is the uncertainty in safety assessment of HLW geological disposal taken into consideration in your regulation and legislation?		
Answer	Regulatory Guide G-320, *"Assessing the Long Term Safety of Radioactive Waste Management"*, provides the licensee with information on CNSC's		

expectations for assessing the long term safety of a waste management system, such as a repository for the disposal of used fuel or other wastes. The guide identifies expectations with respect to uncertainties (including the need to take explicit account of uncertainty when comparing deterministic and probabilistic assessment results with the acceptance criteria.)

For deterministic assessments, the range of uncertainty in the calculated result, as determined by a sensitivity analysis (or importance analysis), is expected to be clearly provided in the comparison. For probabilistic assessments, the likelihood of exceeding the acceptance criterion should be determined from the calculated results distribution, if the criterion is expressed as a single value of consequence. The guide indicates expectations for a formal uncertainty analysis of the predictions, suggesting that the analysis should distinguish between uncertainties arising from input data, scenario assumptions, the mathematics of the assessment model, and the conceptual models.

Q. No 54	Country	Article	Ref. in National Report
	Japan	Article 15	H(P87-P93)

Question/ Comment: How is the human intrusion in safety assessment of HLW geological disposal taken into consideration in your regulation and legislation?

Answer: Regulatory Guide G-320, *"Assessing the Long Term Safety of Radioactive Waste Management"*, provides the licensee with information on CNSC expectations for the assessment of disruptive event scenarios, including human intrusion, for the long-term radioactive waste repositories, such as high level waste and other radioactive wastes.

Assessments of human intrusion are expected to estimate the exposure of persons and the environment, which may result from the waste redistribution and loss of containment. Where the waste redistribution and loss of containment is the result of inadvertent intrusion (meaning that the intruder is unaware of the hazard), an estimate should be made of the exposure to the intruder. Scenarios of intentional human intrusion do not need to consider exposure to the intruder.

Scenarios assessing the risk from inadvertent intrusion are recognized as being case-specific, based on the type of waste and the design of the facility, and should consider both the probability of intrusion and its associated consequences. G-320 also acknowledges that surface and near-surface facilities (e.g., tailings sites) are more likely to experience intrusion than deep geological facilities. As scenarios concerning inadvertent human intrusion into a waste facility may predict doses that are greater than the regulatory limit, the CNSC expects results to be interpreted in light of the degree of uncertainty associated with the assessment, the conservatism in the dose limit, and the likelihood of the intrusion. Both the likelihood and the risk from the intrusion are expected to be reported.

Reasonable efforts are expected to be taken, in order to limit the dose from a

high-consequence intrusion scenario, and reduce the probability of the intrusion occurring. The consequences of intrusion are expected to be reduced by controlling the form and properties of the waste accepted at the facility. Design modifications should be considered or undertaken, so as to reduce the likelihood of inadvertent intrusion. The CNSC expects this may include the choice of site for the facility (where site selection options are feasible) such as: siting the facility at depths that discourage intrusion; locations that have no useful resources; incorporating robust design features that make intrusion more difficult; and implementing active or passive institutional controls, as appropriate for various facilities (such as tailings areas.)

Q. No 55	Country	Article	Ref. in National Report
	Japan	Article 15	H(P87-P93)

Question/ Comment: Would you explain the leagal basis of the safety case?

Answer: The legal requirements associated with the long-term safety of radioactive waste management, including the disposal facilities, can be found in several portions of the *Nuclear Safety and Control Act* and the Regulations made pursuant to it. These include, but are not limited to, the following:

1. Paragraph 12(1)(c) of the *General Nuclear Safety and Control Regulations* requires
that a licensee, "take all reasonable precautions to protect the environment and the health and safety of persons and to maintain security";
2. Paragraph 4(d) of the General Nuclear Safety and Control Regulations requires that an application for a licence to abandon a nuclear substance, nuclear facility, prescribed equipment or prescribed information contain, in addition to other information, "the effects on the environment and the health and safety of persons that may result from the abandonment, and the measures that will be taken to prevent or mitigate those effects";
3. Paragraph 3(k) of the *Class I Nuclear Facilities Regulations* requires that an application for a licence for a Class I nuclear facility, other than a licence to abandon, include, "the proposed plan for the decommissioning of the nuclear facility or of the site";
4. Paragraph 4(e) of the *Class I Nuclear Facilities Regulations* requires that an application for a licence to prepare a site for a Class I facility contain, in addition to other information, "the effects on the environment and the health and safety of persons that may result from the activity to be licensed, and the measures that will be taken to prevent or mitigate those effects";
5. Paragraph 5(f) of the *Class I Nuclear Facilities Regulations* requires that an application for a licence to construct a Class I nuclear facility include, "a preliminary safety analysis report demonstrating the adequacy of the design of the nuclear facility";
6. Paragraph 5(i) of the *Class I Nuclear Facilities Regulations* requires information on, "the effects on the environment and the health and safety of persons that may result from the construction, operation and decommissioning of the nuclear facility, and the measures that will be taken to prevent or mitigate

those effects";
7. Paragraph 5(j) of the *Class I Nuclear Facilities Regulations* requires information on "the proposed location of points of release, the proposed maximum quantities and concentrations, and the anticipated volume and flow rate of releases of nuclear substances and hazardous substances into the environment, including their physical, chemical and radiological characteristics";
8. Paragraph 5(k) of the *Class I Nuclear Facilities Regulations* requires information on, "the proposed measures to control releases of nuclear substances and hazardous substances into the environment";
9. Paragraph 6(c) of the *Class I Nuclear Facilities Regulations* requires that an application for a licence to operate a Class I nuclear facility include, "a final safety analysis report demonstrating the adequacy of the design of the nuclear facility";
10. Paragraph 6(h) of the *Class I Nuclear Facilities Regulations* requires information on, "the effects on the environment and the health and safety of persons that may result from the operation and decommissioning of the nuclear facility, and the measures that will be taken to prevent or mitigate those effects";
11. Paragraph 6(i) of the *Class I Nuclear Facilities Regulations* requires information on, "the proposed location of points of release, the proposed maximum quantities and concentrations, and the anticipated volume and flow rate of releases of nuclear substances and hazardous substances into the environment, including their physical, chemical, and radiological characteristics";
12. Paragraph 6(j) of the *Class I Nuclear Facilities Regulations* requires information on, "the proposed measures to control releases of nuclear substances and hazardous substances into the environment";
13. Paragraphs 7(f) and (k) of the *Class I Nuclear Facilities Regulations* require that an application for a licence to decommission a Class I facility contain, in addition to other information, "the effects on the environment and the health and safety of persons that may result from the decommissioning, and the measures that will be taken to prevent or mitigate those effects," and, "a description of the planned state of the site on completion of the decommissioning";
14. Paragraph 8(a) of the *Class I Nuclear Facilities Regulations* stipulates that an application for a licence to abandon a Class I nuclear facility shall contain, in addition to the information required by sections 3 and 4 of the *General Nuclear Safety and Control Regulations*, "the results of the decommissioning";
15. Subparagraph 3(a)(viii) of the *Uranium Mines and Mills Regulations* requires that an application for a licence in respect of a uranium mine or mill, other than a licence to abandon, contains, in addition to the information required by section 3 of the *General Nuclear Safety and Control Regulations*, "the proposed plan for the decommissioning of the mine or mill";
16. Subparagraph 3(c)(iii) of the *Uranium Mines and Mills Regulations* requires that an application for a licence in respect of a uranium mine or mill, other than a licence to abandon, contains information on, "the effects on the environment that may result from the activity to be licensed, and the measures that will be

taken to prevent or mitigate those effects";
17. Subparagraph 3(d)(i) of the *Uranium Mines and Mills Regulations* requires that an application for a licence in respect of a uranium mine or mill, other than a licence to abandon, contains information on, "the effects on the health and safety of persons that may result from the activity to be licensed, and the measures that will be taken to prevent or mitigate those effects";
18. Paragraph 7(d) of the *Uranium Mines and Mills Regulations* requires that an application for a licence to decommission a uranium mine or mill contains, "a description of the planned state of the site upon completion of the decommissioning work"

Q. No 56	Country	Article	Ref. in National Report
	Romania	Article 16	Section H, page 157
Question/ Comment	How do you presently handle the organic liquids waste?		
Answer	Non-radioactive organic liquids are bulked and sent to a hazardous waste processing facility in Canada. Facilities for mixed (i.e. radioactive and hazardous) liquid wastes do not exist in Canada. Therefore, a commercial service in the U.S. has been used for the destruction of mixed wastes.		

Q. No 57	Country	Article	Ref. in National Report
	Romania	Article 16	Section H, page 157
Question/ Comment	Are there any criteria other than radio nuclides half life used for classification (e.g.: physical, chemical, biological).		
Answer	No. The classification system was developed to allow some flexibility in the management of radioactive waste and in the eventual design of the long-term management facility. Although there was no formal classification system in Canada prior to the publication of CSA document N292.3, the segregation of radioactive waste was done according to on-contact dose rates.		

Q. No 58	Country	Article	Ref. in National Report
	Romania	Article 16	Section H9, page 90
Question/ Comment	The operation licence does not include a record for unusual events?		
Answer	The requirement for a licensee to record and report unusual events is set out by Section 29 of the *General Nuclear Safety and Control Regulations*, under "General Reports". Additionally, facility-specific reporting requirements can be set out by licence conditions tailored for the unique circumstances associated with any particular operating licence.		

Q. No 59	Country	Article	Ref. in National Report
	Russian Federation	Article 16	Section 7.1, p.177
Question/ Comment	Is there a decommissioning concept for WR1 reactor? Why the term is 200 and not 100 years? What is economical justification for 200 year long monitoring of the reactor and		

what would be the cost compared to immediate decommissioning?

Answer 1) The decommissioning concept for WR-1 is to maintain the current interim end-state (Storage-with-Surveillance), benefiting from radioactive decay, until disposal facilities are available (~50 years), then complete final decommissioning and dismantlement, and then transport contaminated waste materials to an approved disposal facility.

A feasibility study is currently under way to consider an alternate plan. The alternate plan would be to complete final decommissioning as soon a practicable (in a 15 to 20-years timeframe) and store contaminated waste materials in specially designed storage facilities at Whiteshell Laboratories (WL), until a facility is built for the long-term management of the wastes.

2) An institutional control period of 200 years is based on radioactive decay for key contaminants (such as the half-life of Cs-137) in earthen trenches and contaminated land (Cs Ponds) planned for in-situ disposal. A shorter period may be defensible, depending on the levels of decontamination, detailed characterization and analysis, future use of the land etc. The actual wording in the Environmental Assessment is stated as "until in-situ waste is acceptable for unconditional release". A case would eventually be made that it is safe to cease institutional control - that might happen sooner (100 years) or later (200 years).

3) There was no plan to monitor the reactor for 200 years. The latest timeframe considered for a full decommissioning of the reactor was 60 years, and AECL is now considering shortening it to 20 years. Institutional control and monitoring beyond 60 years was for in-situ wastes only, and was envisioned to be nominal, with full decommissioning of all facilities being completed, and all stored wastes and spent fuel already removed from the site.

Q. No 60	Country	Article	Ref. in National Report
	China	Article 17	Section H.10.1,p.90

Question/ Comment: In Canada, how long institutional control period is required for decommissioned uranium mining and milling sites?

Answer: Canada has not specifically defined a time period for institutional control. The province of Saskatchewan has established an institutional control program for uranium mines in that province (section H.10.3), but this program does not identify any time limit for the institutional control period. The length of the institutional control period would be determined on a case-by-case basis, according to the information provided in an abandonment licence application (Section H.10.1) and provincial or territorial regulatory requirements.

Q. No 61	Country	Article	Ref. in National Report
	United Kingdom	Article 17	P84, H3.1

Question/ Comment: (1) What are the arrangements for collecting seepage from direct in-ground burial?

(2) Approximately how much does the collected seepage represent as a proportion of the total seepage?

Answer 1) Seepage and runoff from the Port Granby Waste Management Facility are captured in collection ponds, located in the lower parts of the east and west gorges downstream of the direct in-ground burial areas, within the waste management site. The collected seepage and runoff is subsequently pumped from the collection ponds to the on-site water treatment facility.
2) Approximately 80% of the total seepage and runoff from the site is captured by the east and west collection ponds.

Q. No 62	Country	Article	Ref. in National Report
	Russian Federation	Article 18	E.2, p. 35

Question/ Comment a) What is the status of the Policy Framework for Radioactive Waste in the hierarchy of the regulatory documents?
b) Who approved it and is it obligatory for the regulatory body?

Answer a) The *Policy Framework for Radioactive Waste* (1996) is an overarching Government of Canada policy, which provides the national context for radioactive waste management and a set of principles to ensure that the management of radioactive waste is carried out in a safe, environmentally sound, comprehensive, cost-effective and integrated manner.
b) It was approved by the Government of Canada in 1996, and thus is not a regulatory document issued by the Canadian Nuclear Safety Commission (CNSC). The *Nuclear Safety and Control Act* (NSCA) is consistent with the *Policy Framework*, and the CNSC takes into consideration federal government policy when making regulatory decisions under the NSCA.

Q. No 63	Country	Article	Ref. in National Report
	United States of America	Article 18	Section E.8.2, Page 51

Question/ Comment The report describes the requirements for consultation with Aboriginal groups as prospective rights holders. a) What are the requirements for agreement with the proposed action by the Aboriginal groups? b) If none, is there a requirement to obtain agreement from these groups that the specified level of consultation has been performed?

Answer a) In its decision in *Haida Nation v. British Columbia* (Minister of Forests), (2004), the Supreme Court of Canada directed that:

"Where a strong prima facie case exists for the claim and the consequences of the government's proposed decision may adversely affect it in a significant way, addressing the Aboriginal concerns may require taking steps to avoid irreparable harm or to minimize the effects of infringement, pending final resolution of the underlying claim... This process does not give Aboriginal groups a veto over what can be done with land pending final proof of the claim. The Aboriginal "consent" spoken of in Delgamuukw is appropriate only in cases of established rights, and then by no means in every case. Rather, what is required is a process

of balancing interests, of give and take."

b) Also in the *Haida* decision, the Court found that "the scope of the duty is proportionate to a preliminary assessment of the strength of the case supporting the existence of the right or title, and to the seriousness of the potentially adverse effect upon the right or title claimed. The Crown is not under a duty to reach an agreement; rather, the commitment is to a meaningful process of consultation in good faith."

In summary, the duty arises when the Crown has knowledge, real or constructive, of the existence of a potential or established Aboriginal right or title, and contemplates conduct that might adversely affect it. The scope of the duty is proportionate to a preliminary assessment of the strength of the case supporting the existence of the right or title, and to the seriousness of the potentially adverse effect upon the right or title claimed. As to the content of the duty, the Court said that good faith on both sides is required at every stage, and sharp dealing is not permitted. The effect of good faith consultation may be to reveal a duty to accommodate. The Court said that this process does not give Aboriginal groups a veto over what can be done with land pending final proof of the claim; nor does it impose a duty to reach an agreement.

Q. No 64	Country	Article	Ref. in National Report
	China	Article 19	Section E.4.2,p.43
Question/ Comment	Are applicants required to submit the radioactive waste management program when applying for construction or operation license?		
Answer	Yes, paragraph 3(1)j of the *General Nuclear Safety and Control Regulations,* under "General Application Requirements", stipulates the following:		

"[…]the name, quantity, form, origin and volume of any radioactive waste or hazardous waste that may result from the activity to be licensed, including waste that may be stored, managed, processed or disposed of at the site of the activity to be licensed, and the proposed method for managing and disposing of that waste[…]"

Q. No 65	Country	Article	Ref. in National Report
	France	Article 19	E.3.2 p. 39
Question/ Comment	Could Canada indicate the criteria defining facilities of Class I and Class II in term of activity (concentration, total activity, references to classes of radio-nuclides…)?		
Answer	Class I facilities are classified as either Class IA or Class IB. The *Class I Nuclear Facilities Regulations* describe a facility as being Class IA if it is:		

(i) a nuclear fission or fusion reactor, or subcritical nuclear assembly; or
(ii) a vehicle that is equipped with a nuclear reactor.

The *Class I Nuclear Facilities Regulations* describe a facility as being Class IB if it is a:

(i) facility that includes a particle accelerator, other than a particle accelerator described in paragraphs (*d*) and (*e*) of the definition "Class II prescribed equipment" in section 1 of the *Class II Nuclear Facilities and Prescribed Equipment Regulations* (http://laws.justice.gc.ca/en/ShowDoc/cr/sor-2000-205///en?page=1);

(ii) plant for the processing, reprocessing or separation of an isotope of uranium, thorium or plutonium;

(iii) plant for the manufacture of a product from uranium, thorium or plutonium;

(iv) plant other than a Class II facility that processes or uses nuclear substances other than uranium, thorium or plutonium in a quantity greater than 10^{15} Bq per calendar year;

(v) facility for the disposal of a nuclear substance generated at another nuclear facility; and

(vi) facility prescribed by paragraph 19(*a*) or (*b*) of the *General Nuclear Safety and Control Regulations* (http://laws.justice.gc.ca/en/ShowDoc/cr/sor-2000-202///en?page=1).

The *Class II Nuclear Facilities Regulations* describe a facility as being Class II if it contains Class II prescribed equipment. Class II prescribed equipment includes:

(i) an irradiator that uses more than 10^{15} Bq of a nuclear substance;

(ii) an irradiator that requires shielding which is not part of the irradiator and that is designed to deliver a dose of radiation at a rate exceeding 1cGy/min at a distance of 1 m;

(iii) a radioactive source teletherapy machine;

(iv) a particle accelerator that is capable of producing nuclear energy and has a beam energy of less than 50MeV for beams of particles with a mass equal to or less than 4 atomic mass units;

(v) a particle accelerator that is capable of producing nuclear energy and has a beam energy of no more than 15 MeV per atomic mass unit for beams of particles with a mass greater than 4 atomic units;

(vi) a brachytherapy remote afterloader.

Q. No 66	Country	Article	Ref. in National Report
	France	Article 19	E.4.2 p. 45

Question/ Comment: Could Canada precise if there are fuel storage licenses directly derived from general licenses delivered for storage casks?

Answer: These activities are conducted under one CNSC licence.

For example, a CNSC licence for a spent fuel dry storage waste management facility includes the activity of transferring storage casks to the spent fuel dry storage waste management facility.

The transportation of storage casks containing spent fuel to the waste management facility will also have to meet the requirements in the *Packaging and Transportation Regulations*. However, there is no separate Packaging and Transportation licence.

Q. No 67	Country	Article	Ref. in National Report
	Germany	Article 19	p. 45; Sec. E.4.2; p. 191; Annex 8.1.3.1

Question/ Comment: It is mentioned that typical licence terms for radioactive waste management facilities vary from five to ten years in duration. In some cases, however, licence periods have been issued for indefinite terms. As an example, the Rio Algom Ltd. waste management facility operating licence for decommissioned / inactive uranium tailings sites is explicitly mentioned. Does this practice, on a case-by-case strategy, also apply to spent fuel storage facilities or radioactive waste management facilities? If so, please specify all the facilities whose licence periods have been issued for indefinite terms.

Answer: All licences are issued after a case-specific evaluation. It has been the practice, rather than a defined policy approach, to issue longer-term licences to facilities with relatively low risks and which have proven their safe performance over time. The length of the licence does not determine the compliance monitoring frequency.

Waste facilities with indefinite term licenses are:

Madawaska Closed Mine
Gentilly-1 Waste Management Facility
Douglas Point Waste Management Facility
NPD Rolphton Waste Management Facility
Denison Mine Site
Stanrock Mine Site
Elliot Lake Historic Mine Sites
Port Granby Waste Management Facility
Welcome Waste Management Facility
RWOS-1 Radioactive Waste Management Site 1
Port Hope Consolidated Sites

Q. No 68	Country	Article	Ref. in National Report
	Ireland	Article 19	E.3.1, fourth paragraph page 37

Question/ Comment: The report states that "the CNSC now readily account the health of Canadians in regulating the production, possession and use of nuclear substances in order to ensure the necessary protection of the health of Canadians at times when a serious shortage of medical isotopes in Canada or around the world puts the health of Canadians at risk". Could Canada give an example of when and how

this statement would be implemented and if the health of other countries' population would also be taken into account considering that a large proportion of the world medical isotopes production comes from Canada?

Answer Canada notes that this question is outside the scope of the Articles of the Joint Convention. However, in the spirit of sharing information, Canada has provided the following reply;

The decisions taken by the Commission Tribunal take into account all evidence, including health and safety, through public hearings open to domestic and international intervenors.

The CNSC has demonstrated that it is prepared to act in situations of serious shortage of medical isotopes for the protection of health of Canadians, including instances where Canadian medical isotope production and processing facilities are operable, and those where Canada relies on sources of medical isotopes from foreign production and processing facilities.

In the former instance, the CNSC is ready to respond using licence conditions or amendments to allow the CNSC licensees that produce or process medical isotopes the greatest degree of flexibility in their operations, while maintaining safety, in order to respond to domestic and global demand during times of serious shortage.

In the latter instance, the CNSC is ready to respond (again, using licence conditions or amendments) to allow Canadian importers and end-users of medical isotopes access to increased quantities of medical isotopes (including alternatives), and where practical, to share limited supplies.

Q. No 69	Country	Article	Ref. in National Report
	Russian Federation	Article 19	E.3.2, p. 37

Question/ Comment Which group of the documents are the documents that set up safety requirements to RW management, criticality safety and nuclear facility decommissioning attached to?

Answer The CNSC makes use of various regulatory documents to provide guidance on these various topics. In relation to radioactive waste management, guidance can be found in Regulatory Guide G-320 *"Assessing the Long Term Safety of Radioactive Waste Management"* **and** Regulatory Policy P-290 *"Managing Radioactive Waste"*. Regarding criticality safety, the CNSC applies the ANSI/ANS-8 standard as well as CSA standard N292.2-96. Finally, decommissioning requirements are set out in Regulatory Guide G-219 "Decommissioning Planning for Licensed Activities".

Q. No 70	Country	Article	Ref. in National Report
	Russian Federation	Article 19	E.3.2, p. 40

Question/ For what type of materials are the unconditional clearance levels set up?

Comment	What is the procedure for conditional clearance?
Answer	The Unconditional Clearance Levels (UCL) are set out in the *Nuclear Substances and Radiation Devices Regulations* (NSRDR). They apply to bulk amounts of materials (quantities exceeding 1,000 kg). Hence, no license is required to possess, transfer, import, export, use, mine, produce, refine, convert, enrich, process, reprocess, manage or store bulk amounts of materials (1,000 kg) that contain a nuclear substance, if the nuclear substance's concentration does not exceed its UCL at any one time. Furthermore, no license is required to dispose or abandon bulk amounts of materials (less than 1,000 kg per year, per nuclear facility) if the nuclear substance's concentration does not exceed its UCL. The UCLs have been provided by IAEA-RS-G-1.7 (Application of the Concepts of Exclusion, Exemption and Clearance Safety Guide, 2004) and apply to any type of solid materials, and to non-effluent liquids (*e.g.*, liquids that are disposed after solidification, or incinerated). The NSRDR also allow licensees to develop Conditional Clearance Levels (CCL) on the basis of the same dose criteria as in IAEA-RS-G-1.7, namely, 10 μSv/year to individuals, and to take account of low probability events (an additional criterion of 1 mSv/year is due to such low probability events.) Licensees may therefore derive such Conditional Clearance Levels, specific to the type and fate of the materials considered for clearance. CNSC may review any derivation of CCLs by licensees.

Q. No 71	Country	Article	Ref. in National Report
	Russian Federation	Article 19	E.4.2, p. 43
Question/ Comment	Who organizes and carries out review of Applicant's safety related documentation? Does CNSC have a Guidance on organization and performing of review of the Applicant's safety documentation?		
Answer	At the CNSC, staff from licensing division has the primary responsibility for assuring that all appropriate reviews are conducted. Licensing divisions make use of technical support divisions within the CNSC to conduct the review of safety documentation. This documentation is assessed and compared against regulatory requirements, including federal and provincial legislation, national and international standards, requirements, best practices and guidance.		

Q. No 72	Country	Article	Ref. in National Report
	Russian Federation	Article 19	E.3.2, p. 40
Question/ Comment	Are there any clearance levels available for nuclear facility sites, for buildings and constructions?		
Answer	There are no Unconditional Clearance Levels established for specific applications, such as sites or buildings. Licensees, however, may develop criteria such as Conditional Clearance Levels.		

Q. No 73	Country	Article	Ref. in National Report
	Russian Federation	Article 19	E.6.3, p. 48
Question/ Comment	Does the standard list of topics for inspections of nuclear facilities include criticality safety issues?		
Answer	CNSC staff assesses a licensee's criticality program. The CNSC can also, if warranted, conduct a specific inspections, normally called a Type I inspection, where staff would conduct an audit of the criticality program and its implementation.		

Q. No 74	Country	Article	Ref. in National Report
	Ukraine	Article 19	Para E.3.1, page 36
Question/ Comment	a) What explains three years period between adoption in 1997 by Parliament of this Act and transition it into Law in 2000? b) Are there any differences between them?		
Answer	The most limiting reason for the delay in the *Nuclear Safety and Control Act* (NSCA) becoming law was the development of the associated Regulations. It was important to develop and have approved the nine Regulations required to support the new Act. Also, following the passage of a bill by Parliament (as in the case of the NSCA in March 1997), it is then sent to the Senate for approval. No bill can become law in Canada without Senate approval. Once approved, the NSCA and its associated Regulations were presented to the Governor General for royal assent, and became law. Royal assent of the NSCA and the associated Regulations was given in May 2000.		

Q. No 75	Country	Article	Ref. in National Report
	Ukraine	Article 19	Para E.3.2 , page 37
Question/ Comment	How regulatory acts developed by one regulator are agreed by other regulatory bodies? What organizations they are agreed with?		
Answer	An Act requires Parliamentary approval. Regulations are made under the authority of the Act and require the approval of the Government of Council Canada with formal consultation.		

Q. No 76	Country	Article	Ref. in National Report
	Ukraine	Article 19	Para E.4.2 , page 43
Question/ Comment	The Report says that the stage of site preparation requires separate license. What is the subject of licensing for this stage and how the performance of such license conditions is controlled?		
Answer	The purpose of a separate licence for site preparation is to assure that the applicant, at this stage of the planning process, considers key issues associated		

with the proposed future development of the nuclear facility, prior to any activities that would begin to physically alter the environment; and that the planning, preparation and proposed work are acceptable to the CNSC before the applicant proceeds to construction or operations. Specific requirements for this phase of licensing are set out under Section 4 of the *Class I Nuclear Facilities Regulations*.

Q. No 77	Country	Article	Ref. in National Report
	United Kingdom	Article 19	P45, E.4.2
Question/ Comment	Mid-term or status updates are required from licence holders for spent fuel and radioactive waste management facilities. What do these reports cover in terms of nuclear and environmental safety assessment?		
Answer	When the CNSC Commission Tribunal (Tribunal) issues a licence or renews a licence, they may request the proponent to return at certain points during the licence period, to update the Tribunal on the operations and performance of the facility. The mid-term reports (or status reports) provide the Tribunal with an opportunity to examine the performance of the facility. These reports will cover all safety areas. The safety areas that are typically covered include operations, radiation protection, environmental monitoring, maintenance programs etc. The review of the safety areas in the mid-term or status reports allows the decision-makers to stay informed about the facilities' operations and performance.		

Q. No 78	Country	Article	Ref. in National Report
	United Kingdom	Article 19	P50, E.8.1
Question/ Comment	(1) What is the budget for CNSC in FY 2008/2009? (2) What is the balance between government funding and income from fees and cost recovery?		
Answer	1) The budget for CNSC in FY 2008/2009 was $ 117, 685, 000. 2) Of the budget for CNSC in FY 2008/2009; 74 % is from income from fees and cost recovery and the remaining 26% is from government funding.		

Q. No 79	Country	Article	Ref. in National Report
	United Kingdom	Article 19	P52, E.9.1
Question/ Comment	CNSC has a clear mandate on health, safety and environment but not economic matters. Does this mean that CNSC needs external advice on economic matters relating to application of ALARA (F.6.1)?		
Answer	No, the CNSC has external expertise on the application of ALARA. The statement was meant to explain that the CNSC does not regulate other economics of the nuclear industry.		

Regulatory Guide G-129 rev. 1 guides licensees on the type of action that aims to effectively control and minimize doses. It outlines the importance of an explicit commitment by senior management to limit doses to magnitudes that are ALARA, the need for suitable programs to achieve this objective, and the value of reviewing work-related doses periodically to ensure that they continue to be adequately controlled.

Q. No 80	Country	Article	Ref. in National Report
	United States of America	Article 19	Section E.4.1, Page 42
Question/ Comment	When a Designated Officer is delegated the responsibility for issuing certain types of licenses, no public hearing occurs, unless the DO refers the decision back to the Commission Tribunal. What is the mechanism for public input if the issue is not referred back to the Commission Tribunal?		
Answer	There is no mechanism for public input on a Designated Officer's (DOs) consideration of a licence application. The DOs have to provide hearing opportunities on different matters before making decisions, but this applies only to the applicant, licensee or persons named in or subject to Orders, not to the public. More information can be found under paragraphs 38 and 39 of the NSCA. (please see www.nuclearsafety.gc.ca)		

Q. No 81	Country	Article	Ref. in National Report
	United States of America	Article 19	Section E.4.2, Page 44
Question/ Comment	The Canadian Nuclear Safety Commission uses a "harmonized joint review process" with other federal, provincial, or territorial departments. The Commission expects nuclear facilities would comply with all applicable federal or provincial regulations. How does Canada assure, at the federal level, provincial regulations do not establish excessive requirements? Do provincial departments have the right to litigate issues in civil courts?		
Answer	The Federal government works with the Provincial governments to establish guidelines for health and safety of humans and the environment. These guidelines are often assumed as Provincial standards. The Provinces can establish standards which are different from the guidelines. The Provinces have the authority to impose and enforce their own requirements, through their own legislation. Historically, the Provinces have tried to harmonize their legislation among themselves, and have worked cooperatively with the federal government. Where Federal legislation exists, it takes precedence over Provincial legislation.		

Q. No 82	Country	Article	Ref. in National Report
	Hungary	Article 20	E.3.2 p.37-39
Question/ Comment	How can Canada solve the coordination of the multiple regulator system (federal, provincial, territories) in radiation safety?		
Answer	Two delegates from the CNSC are currently members of the Federal Provincial Territorial Radiation Protection Committee (FPTRPC). The FPTRPC's mission		

is to advance the development and harmonization of practices and standards for radiation protection within Federal, Provincial and Territorial jurisdictions. The FPTRPC details can be viewed at: http://www.hc-sc.gc.ca/ewh-semt/radiation/fpt-radprotect/index-eng.php

Q. No 83	Country	Article	Ref. in National Report
	France	Article 21	F.1 - p. 55

Question/ Comment: Article 21 of the Convention stipulates that if there is no license holder, the responsibility rests with the Contracting Party.
Could Canada indicate which entity precisely would be responsible in such a case?

Answer: In cases where the government must step in, to ensure the safety of spent fuel or radioactive waste, the specific organization responsible would be dependent on the circumstances surrounding the waste, and particularly whether a province or the federal government has primary responsibility. For example, legacy and historic waste on provincial crown land would generally be the responsibility of the province. Where the federal government is responsible, the Low-Level Radioactive Waste Management Office (LLRWMO) - operated by Atomic Energy of Canada Limited (AECL) - is the organization that typically takes on the responsibility for safe management of wastes.

In instances where remedial actions are required at uranium mine and mill tailings facilities where the owner no longer exists, the Government of Canada and Provincial governments ensure that the sites are safely decommissioned. The Federal government has entered into Memoranda of Agreement with Ontario and Saskatchewan, the two provinces where uranium mining has occurred. These memoranda set out roles and responsibilities for the management of such sites, along with and cost-sharing arrangements. In both cases, clean-up costs are shared on a 50-50 basis for abandoned and certain legacy mine and mill sites.

Q. No 84	Country	Article	Ref. in National Report
	United Kingdom	Article 21	P60, F.6.1 and F.6.2

Question/ Comment: CNSC has published regulatory guidelines on how to keep exposures as low as reasonably achievable.
(1) Are there national dose limits/constraints that must not be exceeded?
(2) If so, how do these relate to setting derived dose limits for releases to air and water from nuclear facilities?

Answer: 1) Yes. The CNSC provides its effective and equivalent dose limits for Nuclear Energy Workers (NEWs) and member of the public in Sections 13 and 14 of the *Radiation Protection Regulations*. The effective dose limits for NEWs is 100 millisievert (mSv) over a five-year period, or 50 mSv per year. The dose limit for pregnant NEW is 4 mSv for the balance of the pregnancy, and the dose limit for members of the public is 1 mSv per year. The equivalent annual dose limits for NEWs are 150 mSv for the lens of the eye, and 500 mSv for both the skin

and the extremities. The equivalent annual dose limits for member of the public are 15 mSv for the lens of the eye, and 50 mSv for both the skin and the extremities.

CNSC regulations do not incorporate dose constraints, and the only requirement in the current *Radiation Protection Regulations* is for licensees to maintain doses below regulatory limits, and ALARA.

2) The derived release limit (DRL) for a given radionuclide is the release rate that would cause an individual of the most highly exposed group to receive, and be committed to, a dose equal to the CNSC annual dose limit for public (1 mSv/year), resulting from the release of radionuclides to the air or surface water during normal operation of a nuclear facility, over a period of one calendar year. The DRLs are calculated independently for releases to air and to surface water.

Q. No 85	Country	Article	Ref. in National Report
	United Kingdom	Article 21	P61, F.6.3

Question/ Comment: What values are typically set for action levels for different parts of a radiation protection programme?

Answer: Action levels are typically site- and facility-specific. Action levels are proposed by the licensee, and subject to the CNSC's review and approval before being incorporated to a CNSC licence.

Actions levels may be expressed in terms of any parameter that, if reached, may indicate a loss of control of an associated part of the licensee's radiation protection program. Some examples of parameters are - but not limited to - individual dose, ambient dose rate, surface contamination level, and ventilation rate.

Q. No 86	Country	Article	Ref. in National Report
	France	Article 22	F.4.3 - p. 58

Question/ Comment: Licensees must provide guarantees that adequate financial resources are available.
a) Could Canada precise if any periodic update of the cost evaluation performed by licensees has been implemented ?
b) If any, could Canada describe the regulatory requirements regarding these periodic updates ?
c) Could Canada detail the requirements for operators when evaluating their decommissioning costs?
d) Do they have to address uncertainties, regarding technical scenarios for instance?

Answer: a) Regulatory Guide G-206 "*Financial Guarantees for the Decommissioning of Licensed Activities*" (available on the CNSC Web site at www.nuclearsafety.gc.ca) indicates that periodic reviews of financial guarantees are required, in order to assure that they remain adequate, or to justify changes in their value. For the last several years, CNSC staff has been recommending,

through the imposition of licence conditions, that these updates should occur at least every 5 years, or whenever conditions change in a manner that would affect the value of the guarantee.

b) The licensee must update their preliminary decommissioning plan, so as to anticipate the highest decommissioning liability within the proposed review period. The cost evaluation must also consider third-party decommissioning costs, with an appropriate contingency, escalated using defensible financial projections, until the end of the review cycle. This assures that the financial guarantee is adequate to fund decommissioning (should it be required), until the process is repeated.

c) Cost estimates are developed based upon guidance found in Regulatory Guide G-206 *"Financial Guarantees for the Decommissioning of Licensed Activities"*, and based upon Preliminary Decommissioning Plans developed by the licensee in accordance with Regulatory Guide G-219, *"Decommissioning Planning for Licensed Activities"*, which is available on the CNSC Web site at www.nuclearsafety.gc.ca. The key requirement for the cost estimate is that it should be adequate to fund the full decommissioning of the facility to accepted end state conditions, using contracted parties, with an adequate contingency to account for uncertainties.

d) Uncertainties have to be addressed. If there is not enough information available to determine the impact of an uncertainty, then worst-case scenarios need to be developed.

Q. No 87	Country	Article	Ref. in National Report
	Japan	Article 22	K4.4 (P104)

Question/ Comment: a) Are the trust fund deposits determined based on NWMO proposal?
b) If any other problems to establish the fund, please show them. Is there an estimation of sloving the problem?

Answer:

a) In the initial years, the trust fund deposits were set out in statute. With the passage of the *Nuclear Fuel Waste Act* (NFWA)(2002), the waste owners were required to establish trust funds and make annual deposits, according to levels set out in the act legislation for each of their respective four companies.

The NFWA also stated that, once the Government of Canada selected the plan for the long-term management of spent fuel, NWMO would be responsible for proposing a funding formula and the amount of trust fund deposits required from each waste owner for the upcoming fiscal year. In 2007, the Government selected the Adapted Phased Management (NWMO's proposal) as Canada's plan. Accordingly, NWMO proposed a funding formula to address the financial costs of implementing the Adaptive Phased Management. This funding formula is presently with the Minister of Natural Resources Canada, for review and approval.

NWMO has also proposed a schedule of trust fund deposits to be made by each of the waste owner companies, as required to implement the Adaptive Phased Management.

b) There are no problems with the establishment of the funds. Each of the four waste owners set up their trust funds in 2002, and have been making the required annual deposits. As of December 2008, the total balance of these funds was $1.5 billion.

Q. No 88	Country	Article	Ref. in National Report
	Romania	Article 22	Section F4.3, page 59
Question/ Comment	Financial guarantees: a) What are the new criteria for a revised policy and financial guarantees? b) Which is the role of the State (government) as a final responsible for the long term safety of repositories?		
Answer	a) As the policy has not been fully developed or accepted by the CNSC, it is premature to provide a full response to this enquiry, other than to note that the policy is intended to be broader in scope and more inclusive of regulated activities. b) The government, through the CNSC, is responsible for the licensing of repositories, and consequently for the independent assessment and acceptance of the safety case for any proposed repository.		

Q. No 89	Country	Article	Ref. in National Report
	United States of America	Article 22	Section F.4.2, Page 58
Question/ Comment	The report states that the Gunnar site has experienced "environmental impacts on local soils and lakes." Please describe the extent of these impacts. Please also describe the activities involved in the "first phase of the cleanup."		
Answer	Specifically, the Lorado mill site has contributed contaminants to Beaverlodge Lake, through wind-blown tailings and the leaching of contaminated water from a small adjacent lake containing most of the tailings. During the operating phase, it is likely that contaminated site waters (or drainage) also reported directly to Beaverlodge Lake. There is some evidence of localized impacts immediate to the site, although the overall health of Beaverlodge Lake has likely not been affected directly by Lorado. The regional cumulative effects from historical operations at the 90 mines and two mill tailing management areas, have caused some measurable impacts to Beaverlodge Lake. The mine and mill at Gunnar have impacted Lake Athabasca through direct drainage of tailings water to the shore of the lake, as well as wind-blown tailings and leaching of mine water. Localized impacts on water quality and fish have been measured from this historical site. The first phase of the cleanup has not yet started. Numerous characterization studies have been completed at both sites, which are secured and monitored by the provincial government staff or their contractor. The joint environmental		

assessment process is underway for the work at Gunnar. No proposal for cleanup of the Lorado site has yet been put forward to Federal authorities, as the plan is to clean-up the two sites in sequence, rather than in parallel.

Q. No 90	Country	Article	Ref. in National Report
	United States of America	Article 22	Section F.4.3, Page 58
Question/ Comment	a) Please describe the process by which licensees are to estimate financial assurance for decommissioning. b) Have such estimates proven adequate in the past?		
Answer	a) The licensee must develop a preliminary decommissioning plan that anticipates the highest decommissioning liability within the proposed review period. The plan must clearly set out the facility design, the decommissioning objectives, the hazards, the mechanisms and the schedule of activities that must be conducted in order to allow the facility to be decommissioned. Then, the licensee must develop a cost estimate, based upon the preliminary decommissioning plan that would anticipate the present day value of costs of conducting that activity, using third party contractors, and assuming no credit for salvage, as well as calculating a contingency tied to the uncertainty of the decommissioning plan, and allowing for financial escalation based upon the review cycle proposal. Both the preliminary decommissioning plan and the financial guarantee must be assessed by the CNSC and deemed to be adequate, before they can be accepted. b) There have been only several cases of decommissioning that have occurred in Canada, and none of them have been conducted recently, in order to allow for comparative evaluations of predictions and actuals. Nonetheless, some of the major Canadian utilities are using American consultants, who have assessed actual decommissioning costs in the United States and have developed a defendable cost model, adapted for use in Canada. So while there is no comparative experience in Canada just yet, there is a basis by which cost models can be evaluated in relation to actual experience.		

Q. No 91	Country	Article	Ref. in National Report
	United States of America	Article 22	Section F.4.3, Page 58
Question/ Comment	Since the last reporting period, CNSC personnel have continued to participate in developing a Canadian Standards Association document (CSA N294) on decommissioning nuclear facilities. This Standard is expected to be finalized in 2009. Please provide details on progress to date and major elements of CSA N294 during your national presentation in May 2009.		
Answer	The writing committee for the Canadian Standards Association document CSA N294 includes specialists from the Canadian nuclear industry, government and the regulatory body (CNSC). CSA N294 describes an overall approach to decommissioning, and includes all		

clauses that would apply for the decommissioning of licensed facilities, or locations where nuclear substances are managed, possessed or stored. The user must determine the extent to which the clauses apply to their facility or location, and the associated regulatory requirements. The document also addresses the responsibility for a decommissioning plan, an updated preliminary decommissioning plan (PDP), and a final or detailed decommissioning plan (DPD), including all the elements of a PDP and DDP. The document also addresses the responsibility for the funding of eventual decommissioning, which represents a form of a financial guarantee, in some cases.

A draft of CSA N294 has been posted for public review, and the public comments have been addressed. The next step is a ballot vote of the current draft CSA N294. Once a committee consensus has been achieved, and the final review and production edits are complete, the document should be ready for publication in December 2009.

The document is focused on the need to have preliminary decommissioning plans in place, to keep these plans up to date throughout the life-cycle, and to have the necessary finances to address eventual decommissioning.

Q. No 92	Country	Article	Ref. in National Report
	Korea, Republic of	Article 23	p.59 (F.5)

Question/ Comment: Section F.5 of Article 23 states that the licensees of Spent Fuel and Radioactive Waste Management Facilities submit their overall QA program. However, IAEA Safety Standards Series No. GS-R-3 requires adopting a graded approach in application of management system requirements.

Are the applicants required to delineate in their QA program some typical quality program elements for quality control of non-safety items important-to-safety, so called "augmented quality assurance"?

Answer: Although Canada is guided by GS-R-3, this does not represent a national regulatory requirement. Canada has always adopted the principle of a graded approach to its regulatory requirements, even before the publication of GS-R-3. However, this graded approach is not imposed on the licensees in a prescriptive manner, and is only used as a high-level strategy to guide our compliance measurement and assessments of licensees' programs and performance.

The *Canadian Nuclear Safety and Control Act* (NSCA) is applicable to licensed activities. "Licensed activity" is defined as an activity for which a licensee is authorized, described in any of paragraphs 26(a) to (f) of the NSCA:

"a) possess, transfer, import, export, use or abandon a nuclear substance, prescribed equipment or prescribed information;

b) mine, produce, refine, convert, enrich, process, reprocess, package, transport, manage, store or dispose of a nuclear substance;

c) produce or service prescribed equipment;

d) operate a dosimetry service for the purposes of this Act;

e) prepare a site for, construct, operate, modify, decommission or abandon a nuclear facility; or
f) construct, operate, decommission or abandon a nuclear-powered vehicle or bring a nuclear-powered vehicle into Canada."

The NSCA also states that "No licence may be issued, renewed, amended or replaced unless, in the opinion of the Commission, the applicant
a) is qualified to carry on the activity that the licence will authorize the licensee to carry on; and
b) will, in carrying on that activity, make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed."

The *Class I, Class II* and *Uranium Mines and Mills Regulations* require a licence application to include a description of the quality assurance program that will be applied for the activity to be licensed. The acceptability of the quality assurance program is one of the factors used to determine whether the licensee is qualified and has made adequate provision for the protection of the environment, the health and safety of persons, national security and international safeguard.

The consideration of safety or non-safety items is not a factor in the regulations. The regulations apply equally to all items required *for* and *in support of* a licensed activity. Within these licensed activities, licensees may propose a graded application of quality assurance requirements to different items, based on their impact on the protection of the environment, the health and safety of persons, and the maintenance of national security and international obligations to which Canada has agreed. CNSC staff will take these proposals into consideration. Licensees are not required to "delineate in their QA program some typical quality program elements for quality control of non-safety items important-to-safety, so called augmented quality assurance". The licensees have an option to apply grading, but are not required to do so.

Q. No 93	Country	Article	Ref. in National Report
	Bulgaria	Article 24	

Question/ Comment: What are the specific values for the discharges into the atmosphere of radioactive substances from Canadian NPPs for the last two-three years and more specifically isotopes of Strontium and Iodine, Rare Noble Gases, aerosols, Tritium (H-3) and Carbon 14 (C-14)?

Answer: Canada has provided the following example of the airborne emissions (Bq/yr) from two OPG plants over a three-year period for Iodine, Noble Gases, Particulates, Tritium Oxide and Carbon-14:

(Bq/yr)	I-131	Noble Gases	Particulates	Tritium Oxide	C-14
Pickering					

2007	4.60E+07	1.60E+14	7.40E+07	5.60E+14	1.20E+13
2006	1.40E+08	1.90E+14	7.10E+07	5.70E+14	8.00E+12
Darlington					
2007	1.20E+08	1.50E+13	5.90E+07	1.60E+14	1.30E+12
2006	1.21E+08	1.37E+13	6.27E+07	1.34E+14	1.19E+12

Strontium is not individually tracked in the airborne emissions.

Q. No 94 Country: Bulgaria | Article: Article 24 | Ref. in National Report

Question/ Comment: What is the annual effective individual dose for the critical group of the population in the respective region received as a result of these discharges?

Answer: An example of the annual effective individual dose for the critical group of the population from two OPG NPPs is shown below.

Pickering	**Dose (microSv/yr)**
2007	2.65
2006	2.85
Darlington	
2007	1.43
2006	1.12

Q. No 95 Country: Bulgaria | Article: Article 24 | Ref. in National Report

Question/ Comment: What part of the annual effective individual dose for the critical group of the population is caused by the discharges of H-3 and what part is caused by the discharges of C-14?

Answer: An example of the contribution of H-3 and C-14 to the annual effective individual dose for the critical group from two OPG NPPs is shown in the table below:

Pickering	**H-3**	**C-14**
2007	88.7%	0.2%
2006	82.8%	0.1%
Darlington		
2007	79.3%	14.1%
2006	82.3%	9.0%

Q. No 96 Country: United States of America | Article: Article 24 | Ref. in National Report: Section F.6.2, Page 60

Question/ Comment: The report states that licensees typically develop operating targets at a fraction of the derived release limit. Are the operating targets subject to approval by CNSC? How are action levels, operating targets and derived release limits related?

Answer: 1) The operating targets are, indeed, subject to approval by CNSC.

2) The licensees set and maintain their own internal operating targets, which include Derived Release Limits (DRL) and Action Levels. DRLs are expressed as an annual release limit; the weekly and monthly rates of release are further controlled. For gaseous releases, the maintained limit is the annual DRL divided by 52 weeks, while liquid release limits represent the annual DRL divided by 12 months. Weekly airborne releases and monthly liquid releases at each nuclear generating station are compared to the respective weekly and monthly limits, and are reported to the CNSC on a quarterly basis.

In addition, licensees use environmental action levels based on the CNSC Regulatory Guide G-228, *"Developing and using Action Levels"* (2001) as an advance warning level (control measure) for any failure or potential failure of environmental monitoring program, process or equipment.

Typically, an Action Level for a nuclear facility will be developed as part of the CNSC licensing process, in accordance with paragraph 3(1) (f) of the *General Nuclear Safety and Control Regulations*, which requires that an application for a CNSC licence should contain any proposed action level for the purpose of section 6 of the *Radiation Protection Regulations*.

The relationship among regulatory dose limit, DRL and Action Levels is provided below:

Dose limit:
The dose limits for calculating DRLs for member of the general public is that set out in the *Radiation Protection Regulations*, which is 1 mSv/year in this case.

Derived Release Limit:
The Derived Release Limit (DRL) for a given radionuclide is the release rate that would cause an individual of the most highly exposed group to receive and be committed to a dose equal to the regulatory annual dose limit (1mSv/year), due to release of the radionuclide to the air or surface water during normal operation of a nuclear facility over the period of one calendar year.

Action Level:
An Action Level may be expressed in units of radiation dose, or in any terms of any other parameter that could be indicative of a loss of control over a part of the associated radiation protection program.

Q. No 97 Country Article Ref. in National Report

	France	Article 25	F - p. 65
Question/ Comment	Could Canada detail how transboundary harmonization between the different Provinces is achieved ?		
Answer	The *Packaging and Transport of Nuclear Substances Regulations* are applicable to all provinces across Canada. The CNSC works closely with each of the provincial transportation departments. In many cases, provincial transportation inspectors are designated by the CNSC to act on their behalf.		
Q. No 98	Country	Article	Ref. in National Report
	Slovenia	Article 25	page 64
Question/ Comment	Can Canada provide some information about the scope and frequency of national nuclear emergency exercises related to the scope of Joint Convention?		
Answer	Canada will hold national exercises with nuclear operators on a regular basis, but they are not specifically designed under the Joint Convention. The exercise may have a component related to the management of spent fuel or radioactive waste, but this does not represent, in general, the main goal or objective of the exercise.		
Q. No 99	Country	Article	Ref. in National Report
	United States of America	Article 25	Section F.7.3, Page 67
Question/ Comment	The report states that nuclear facility operators are "absolutely and exclusively liable for any civil damages." The report also states that the law "provides special compensation measures that may be imposed by government to replace the normal court process." Does this indicate that the government may determine damages or place a cap on damages? Please describe the ability of nuclear facilities to obtain insurance for damages that are not capped by the government.		
Answer	Canada's nuclear civil liability legislation, the *Nuclear Liability Act* (NLA) establishes a dual system for handling claims arising from a nuclear incident. Under Part I of the NLA, victims of a nuclear incident would submit claims to the operator's insurer, the Nuclear Insurance Association of Canada. The insurers would assess the claims, decide the amount of compensation, and pay the claims on behalf of the liable nuclear installation operator. If the claimant was unsatisfied with the compensation awarded, the court having jurisdiction would hear the claim and make a decision. The Government of Canada can proclaim Part II of the NLA if it determines that a nuclear incident could result in a large number of claims, or if it determines that it is in the public interest to do so. Once Part II is proclaimed, the nuclear installation operator ceases to be liable for injury or damage resulting from the nuclear incident, and instead becomes liable to the Government of Canada for the entire $75 million liability limit amount (minus any claims payments made under Part I). All court proceedings against the operator under Part I are terminated, and all further claims arising from the nuclear incident are then considered by the Nuclear Damage Claims Commission, a quasi-judicial		

administrative tribunal established by the Government of Canada.

Under Part II, the Government of Canada can make regulations to be followed by the Claims Commission with respect to claims compensation, including regulations establishing priorities among claimants, on the basis categories of injury or damage; and regulations excluding, either temporarily or permanently, certain categories of injury or damage from compensation that may be awarded.

Unless otherwise authorized by Parliament, the total of all claim payments made under Part I and Part II of the Act in respect of any one nuclear incident cannot exceed $75 million.

The nuclear installation operators obtain coverage for the full $75 million liability amount from the nuclear insurers.

Q. No 100	Country	Article	Ref. in National Report
	France	Article 26	F.8 - p. 68
Question/ Comment	a) Could Canada detail requirements regarding end states of nuclear facilities after their decommissioning? b) If any, what is the release criteria set up by the regulatory body?		
Answer	a) The end-state of a nuclear facility is defined as its proposed physical, chemical, and radiological condition at the end of the decommissioning process. The final end-state is reached when the applicant demonstrates meeting these criteria. There is no definition of what that end-state should be; it is up to the licensee to determine the future use of their facility. Decommissioning experience in Canada is limited, but in most cases, preliminary decommissioning plans identify an end-state that is either free from regulatory control or is suitable for industrial re-use. (b) Requirements for a Licence to Abandon are set out in the *Class I Nuclear Facility Regulations*, the *Uranium Mine and Mill Regulations* and the *General Nuclear Safety and Control Regulations*. In addition, any remaining nuclear substances at the former site of the licensed activity must be less than the criteria set out under the *Nuclear Substances and Radiation Devices Regulations*, which define when a CNSC licence is required.		

Q. No 101	Country	Article	Ref. in National Report
	France	Article 26	F.8 p. 67
Question/ Comment	Could Canada precise if waste management resulting from facility decommissioning is based on a strategic plan?		
Answer	As indicated in section F.8 of Canada's National Report, large complex nuclear facilities - such as power reactors, research reactors, uranium mine and mills, and uranium refinery faculties - are required to have preliminary decommissioning plans. These plans must be maintained throughout the life of the facility.		

The preliminary decommissioning plan must first identify a decommissioning strategy. Based on this strategy, a decommissioning plan is then developed - and waste management is an integral component of the plan. The various types of decommissioning wastes must be identified, and a clear strategy concerning the management of these wastes is necessary.

Q. No 102	Country	Article	Ref. in National Report
	Germany	Article 26	p. 67; Sec. F.8
Question/ Comment	a) Is the operator free to choose between immediate dismantling and the safe enclosure of a nuclear power plant, or is there a legal preference for one of these decommissioning strategies, especially as part of the Canadian Nuclear Safety Commission's regulatory guide G-219 "Decommissioning Planning for Licensed Activities"? b) If there is such a preference: What are the reasons?		
Answer	a) In accordance with the Canadian approach, each licensee is permitted to propose a preferred method. The licensee must demonstrate that the preferred method can be accomplished safely and securing ensuring the health and safety of persons and the protection of the environment. b) Regulatory Guide G-219 requires that licensees consider and compare alternate strategies.		

Q. No 103	Country	Article	Ref. in National Report
	Japan	Article 26	Exective summary 3.4 (P6)
Question/ Comment	It says 3 prototype power reactors have been partially decommissioned and put into a safe Storage-with-Surveillance state but do you have any policy change, for example "immediate dismantlement"?		
Answer	There have been no changes in the plan concerning the three facilities.		

Q. No 104	Country	Article	Ref. in National Report
	Korea, Republic of	Article 26	p.67 (F.8)
Question/ Comment	How and when is the preliminary decommissioning plan updated to the final detailed plan?		
Answer	A detailed decommissioning plan is required when a decision is made by the licensee to cease operations and to apply for a licence to decommission. The information in the detailed decommissioning plan must be considered in relation to the licensing application. Typically, the applicant uses its preliminary decommissioning plan as a starting point, and updates it with additional details, in order to satisfy the requirements of regulatory guidance documents and CNSC regulations.		

Q. No 105	Country	Article	Ref. in National Report
	Romania	Article 26	Section F, page 61-67
Question/	The text has not any references to INES scale.		

Comment	
Answer	It is the responsibility of the CNSC to file official INES-rated reports with the IAEA. Typically, the CNSC will not report or rate anything less than a 2 on the INES scale. CNSC licensees are trained in INES, and can - if they so chose - issue a reportable event to the CNSC with their interpretation of the INES rating.

Q. No 106	Country	Article	Ref. in National Report
	United States of America	Article 26	Section K.5.2.1, Page 109
Question/ Comment	The report describes several waste streams from Chalk River as being sent offsite for disposal. Where will these wastes be disposed?		
Answer	Facilities for mixed (i.e. radioactive and hazardous) liquid wastes do not exist in Canada. Therefore, a commercial service in the U.S. has been used for the destruction of mixed wastes.		

Q. No 107	Country	Article	Ref. in National Report
	United States of America	Article 26	Section K.5.3.2, Page 112
Question/ Comment	The report states that waste from the Tulita site will be transported to a disposal facility by October 2008. Has it been transported? To what facility?		
Answer	The 1,250-tonne inventory of consolidated uranium ore contaminated soils in Tulita, Northwest Territories, was transported to and disposed at US Ecology's Hazardous Waste Treatment and Disposal Facility in Grand View, Idaho. The last rail car arrived at its destination and was unloaded on January 19, 2009.		

Q. No 108	Country	Article	Ref. in National Report
	Romania	Article 27	Section I3, page 95
Question/ Comment	In the list of controlled substances beryllium and heavy water are not specified, but depleted uranium is. Why?		
Answer	The list provided in Section 1.3 provides examples of controlled nuclear substances pursuant to the NSCA, but the list is not exhaustive. Pursuant to the NSCA, controlled nuclear substances also include both beryllium and heavy water. Please see schedules A.1 and B.1 of the *Nuclear Non-proliferation Import and Export Control Regulations* for the complete list of controlled nuclear substances (available at http://laws.justice.gc.ca/en/ShowFullDoc/cr/sor-2000-210///en).		

Q. No 109	Country	Article	Ref. in National Report
	China	Article 28	Section J.4,p.98
Question/ Comment	(1) How many disused sources are in Canada? (2) What is your plan for the long-term management of the disused sources?		
Answer	1) Licensees do not store or keep inventories of disused sealed sources.		

2) There is not a dedicated repository for disused sealed sources in Canada. Current management practices for disused sealed sources include;
i) managed by owner in their own dedicated waste management facility;
ii) returned to manufacturer to be managed under their long-term management program;
iii) transferred to the AECL Chalk River Laboratories for management and will be managed under AECL's long-term management plans under the Nuclear Legacy Liabilities Program.

Q. No 110	Country	Article	Ref. in National Report
	France	Article 28	J - p. 98

Question/ Comment: Since 2006, a national sealed source registry and sealed source tracking system have been implemented for cat 1 & 2 radioactive sources to report all receipts, transfers imports and exports (NSSR) and to track all high risk radioactive sources throughout their complete lifecycle (SSTS).
Could Canada explain how NSSR and SSTS by CNSC are supervised ?

CNSC planned to extend NSSR to other source categories in 2008.
Could Canada give the first elements of experience feedback concerning NSSR extension ?

Answer: a) The NSSR and SSTS are currently managed under the Transport Licensing and Strategic Support Division. Licensees in possession of sealed sources belonging to Category 1 or 2 are inspected annually by inspectors in the Operations Inspection Division and the Class II Nuclear Facilities Licensing Division. All three divisions are managed under the Directorate of Nuclear Substance Regulation. The group responsible for the management and maintenance of the systems include Licence Administrators, System Managers, Inspectors and Subject Matter Experts. The system security is overseen by CNSC IT Security specialists. The system use and licensee inventories are audited periodically.

b) The CNSC is currently expanding the use of the NSSR to include Category 3, 4 and 5 sources. Licensees are already required to submit their inventories on an annual basis. The intent is to provide secure access and maintenance of their source inventories in an on-line, secure format.

c) The main issue of concern is that there are hundreds of low-risk sources that have been manufactured by licensees for their own use. Most of these sources have generic identifications, rather than unique identifications. This tends to result in multiple sources with identical identifications. This problem is currently under review.

Q. No 111	Country	Article	Ref. in National Report
	France	Article 28	J.4.1 p. 98

Question/ Comment	Could Canada indicate the procedure implemented for orphan sealed sources?
Answer	There is no formal procedure in place for orphan sources. Radioactive materials or sources found with no regulatory control - for instance, in a waste or scrap metal recycling facility - are recovered, secured and investigated, as part of the event response program. The Low-Level Radioactive Waste Management Office (LLRWMO) of Atomic Energy of Canada Limited (AECL) recovers historic radioactive sources, generally including objects with radium-based radio-luminous markings, radium static eliminator bars such as those used in the paper industry and radium-based smoke detectors. This recovery activity takes place on a case by case basis and is performed by LLRWMO staff, its consultants or private-sector consultants. The LLRWMO only recovers orphaned sealed sources that contain radioisotopes from the nuclear fuel cycle, particularly radium-226. The radioactive sources that are accepted by the LLRWMO are managed at LLRWMO facility located at AECL's Chalk River site.

Q. No 112	Country	Article	Ref. in National Report
	Hungary	Article 28	J. p.97-100
Question/ Comment	No information can be found for the inventory of DSRS stored or disposed of (neither quantities nor nuclides).		
Answer	Licensees do not store or keep inventories of disused sealed sources.		

Q. No 113	Country	Article	Ref. in National Report
	Hungary	Article 28	J. p.97
Question/ Comment	Is there any approved concept for disposal of DSRS?		
Answer	Licensees do not store or keep inventories of discussed sealed sources.		

Q. No 114	Country	Article	Ref. in National Report
	Romania	Article 28	Section J4.3, page 100
Question/ Comment	The request for licensee to keep record for a period of three years how was established? Are three years enough?		
Answer	Subsection 28(1) of the *General Nuclear Safety and Control Regulations* (GNSCR) only requires the retention of records for one year following the expiry of the licence, if no other time limit is given in another regulation or in the licence. Furthermore, subsection 28(2) of the GNSCR provides the Commission with the right of refusal for the disposal of the records, so that the Commission can determine if the records should be stored for additional time.		

Q. No 115	Country	Article	Ref. in National Report
	China	Article 32	Section B.7,p.16-17

Question/ Comment	Is activity concentration for individual radionuclide in VLLW limited? If so, please provide the quantitative activity limitation for radionuclides in VLLW.
Answer	CSA document N-292.3 describes very-low-level radioactive waste as that being above the criteria for exemption. Typically VLLW includes bulk material such as low-activity soil and rubble as well as some uranium wastes. There is quantitative activity limitation indicated. The intent was to provide as much flexibility for the owners to factor into their management all elements of the waste management and for the eventual design of the long-term waste management facility.

Q. No 116	Country	Article	Ref. in National Report
	China	Article 32	Section D.2 and D.3,p.25-29
Question/ Comment	(1) Please provide information on storage capacity and operation-start time of storage facilities for SNF and radioactive waste, as listed in Tables D1- D5. (2) Please provide information on the total activity for ILW and LLW stored in Chalk River Lab., as given in Table D.3. (3) Please provide the information on liquid waste volume, other than inventory listed in Tables D3-D5.		
Answer	1) The operational start times and operational status are located in Annexes 4-8. When the bays are nearing full capacity (and usually after 10 to 15 years of wet bay storage), the spent fuel is transferred to on-site dry storage facilities. If more capacity is required, additional interim dry-storage facilities are built. If more capacity is required for radioactive waste, waste may be repackaged to minimize volume, interim facilities are expanded or new interim facilities are built as required. Table D.4 describes the radioactive waste from past practices (no new waste is produced) and no new waste is accepted. 2) Radioactive wastes stored at CRL dates back to 1945. Due to the limitations associated with the waste characterization practices in the past, and the loss of waste-receipt records predating 1956 due to a fire, the total activities are not well known. AECL best estimates of the total activities are 11,770 TBq of solid LLW and 4,120 TBq of solid ILW. 3) The inventory of liquid waste was not included in the aforementioned tables, but the volumes of that waste (approximately 280 m^3) are stated in the pertinent section of the document: Section K.5.2.2.		

Q. No 117	Country	Article	Ref. in National Report
	China	Article 32	Section D.3,p.26-29
Question/ Comment	How much spent resin is stored in Canada? At present, how to treat and dispose of the spent resin generated in NPP?		
Answer	Spent ion exchange resin represents about more than one half of OPG's		

intermediate level radioactive (ILW) waste category. The current quantity is estimated at 5,000 m^3 of ion exchange resin, from current and former OPG reactors. The majority of this (about 80-85%) is stored at a centralized interim waste storage facility. At the generating station, resin is first transferred to a smaller container (the most common being a 3 m^3 resin liner), then is dewatered and transferred to the interim waste storage facility. About 15-20% of the overall volume remains stored at the stations, principally in bulk resin storage tanks.

While plans have not been finalized, the spent ion exchange resin will eventually go to the Deep Geological Repository without further treatment. Radiation fields on individual containers, at the time of disposal, will determine the necessary shielding requirements.

Q. No 118	Country	Article	Ref. in National Report
	France	Article 32	
Question/ Comment	Could Canada give some examples where overlap of jurisdictions and responsibilities creates regulatory issues?		
Answer	Although the nuclear sector is subject to federal jurisdiction through the NSCA, the CNSC utilizes a harmonized or joint review approach with other federal, provincial or territorial departments in such areas as health, environment, transport and labour. The CNSC would expect nuclear facilities to comply with all applicable federal and provincial regulations.		

In recognition of this dual reason, the CNSC has established a joint regulatory process. As a lead agency, the CNSC invites other federal and provincial regulatory agencies whose area of responsibility could impact on the proposed nuclear facility to participate in the licensing process. Those that choose to participate become members of a site-specific Joint Regulatory Group (JRG). CNSC has not encountered any regulatory issues with this approach.

For example, mining is a provincially-regulated industry, but uranium mining is federally-regulated. This does not mean that the province does not have a role in the regulation of a uranium mine, but the responsibility for the regulation of different safety areas in a mine must be clearly defined and agreed upon.

Another example would be in the responsibility of discharges from nuclear facilities. Although the federal nuclear regulator authorizes the conduct of the operation through an operating licence, the operator may be required to have certificates for discharge from the provincial environmental agencies, and be in compliance with other federal and provincial legislation, such as acts administered by Environment Canada and Fisheries and Oceans Canada.

Q. No 119	Country	Article	Ref. in National Report
	France	Article 32	B.4 p. 13
Question/	Could Canada explain how the "Policy Framework for Radioactive Waste" is		

Comment	applied concerning responsibilities of waste producers and owners of disposal facilities ? This question includes uranium-mine waste rock and mill tailings.
Answer	Canada's 1996 *Policy Framework for Radioactive Waste* provides the national context for radioactive waste management and a set of principles to ensure that the management of radioactive waste is carried out in a safe, environmentally sound, comprehensive, cost-effective and integrated manner. The framework states that waste owners are responsible for funding and managing their own wastes. The *Policy Framework* recognizes that arrangements may be different for the three broad categories of radioactive waste in Canada: spent fuel, low- and intermediate-level radioactive waste, and uranium mine and mill tailings. The *Nuclear Safety and Control Act* (NSCA) provides the legislation and regulatory regime to ensure that radioactive waste is properly managed and that financial assurance are provided. The legislation and its associated regulations apply to all forms of radioactive waste, including uranium-mine waste rock and mill tailings. Given the significant costs associated with the long-term management of spent fuel and the importance of finding a national solution, the Government of Canada introduced the *Nuclear Fuel Waste Act* (NWFA) in 2002. This legislation reinforces the responsibility of spent fuel producers to ensure that their wastes are managed appropriately for the long-term, and that funds are set aside for long-term management. Thus, in the case of spent fuel, the framework serves as the overarching policy document to the NFWA.

Q. No 120	Country	Article	Ref. in National Report
	France	Article 32	B.7.2 p. 17
Question/ Comment	Could Canada indicate if currently there is any preferred disposal solution for ILW-SL and ILW-LL?		
Answer	Canada does not have a preferred long-term management approach for short-lived intermediate-level radioactive waste, or long-lived intermediate-level radioactive waste. However, as noted in section K.5, OPG is pursuing the development of a deep geological repository to take low- and intermediate-level wastes from the operation and refurbishment of the OPG-owned reactors in Ontario. Options under study by AECL for the legacy waste at its sites include a geological facility for low- and intermediate-level wastes.		

Q. No 121	Country	Article	Ref. in National Report
	Germany	Article 32	p. 25; Sec. D

Question/ Comment	In the tables D.1 – D.5 (pages 25-29), the inventories of spent fuel, low- and intermediate-level radioactive waste in Canada are specified. As there is also an inventory of high-level liquid waste at AECL from past activities (e.g. spent fuel reprocessing), as stated in Section K.5.2.2 (p. 110) and Annex 5.1.7.1.11 (p. 159), could you please clarify whether the corresponding amount is included in the aforementioned tables?
Answer	The inventory of liquid waste was not included in the aforementioned tables, but the volumes of that waste (approximately 280 m^3) are stated in the pertinent section of the document: Section K.5.2.2.

Q. No 122	Country	Article	Ref. in National Report
	Germany	Article 32	p. 26-29; Sec. D.3; p. 105; Sec. K.5.1

Question/ Comment: In sections D.3 and K.5.1, the facilities for storage of low- and intermediate-level radioactive waste are described.

a) What types of containers are used for the storage of low- and intermediate-level radioactive waste?

b) Is there a plan for an official approval of special container types for the planned geological repository at the Bruce site?

c) Are there plans for a conditioning plant to produce the waste bundles for the repository?

Answer:

a) A variety of containers are currently used for the storage of low- and intermediate- level waste by Ontario Power Generation (OPG).

b) If the existing containers used for interim storage meet the Waste Acceptance Criteria for the repository, they will be used directly. In some cases, the existing waste containers will be overpacked. In the Safety Case for the repository, little or no credit is taken for long-term integrity of the containers. The containers which are to be used must be proposed and accepted as part of the licensing process.

c) There are no plans for a conditioning plant. Spent fuel bundles will not be sent to the repository for OPG's low- and intermediate-level waste.

Q. No 123	Country	Article	Ref. in National Report
	Germany	Article 32	p. 79; Sec. G.16; p.6; Sec. 3.5

Question/ Comment	Monitoring and inspection have shown that some of the fuel containers and spent fuel from the operation of research reactors at the AECL Chalk River Laboratories are subject to corrosion / degradation processes. Are there correlations to be seen between the composition of fuel elements, the spent fuel conditioning, the storage conditions in the tile holes and the magnitude of corrosion / degradation?
Answer	The magnitude of the corrosion/degradation appears to be highly correlated to

the presence of water. The few tile holes found to be dry displayed minimal levels of corrosion or contamination.

Measuring the level of fission product contamination in the tile hole water has been used to infer fuel condition. This method has to recognize that different fuel matrices release fission product inventories at different rates. For example, it appears that oxide fuels tend to release a large fraction of their "gap inventory" of fission products rather quickly, once the cladding is breached; whereas uranium metal fuels release fission products at a lower rate, dependant upon the area of fuel metal that is exposed to the water. It appears that aluminum-clad uranium oxide fuel (NRX driver fuel, used in the 1960s) has approximately twice the defect rate in storage than uranium metal fuels. The Zr-clad HEU/Th MOX fuels have also displayed a high defect rate and contamination release in storage.

None of these fuels were conditioned in the modern sense of the word (they were not subjected to drying or stabilization.)

Q. No 124	Country	Article	Ref. in National Report
	Germany	Article 32	p. 149; Annex 5.1.4
Question/ Comment	There are three types of reinforced concrete bunkers used for the storage of low-level radioactive waste (LLW) in the Hydro-Québec Waste Management Facility: Type A – high-activity level waste, Type B – medium-activity level waste, Type C – low-activity level waste. How is this waste categorisation related to the sub-classification of LLW used in Canada (Section B.7.3, p. 17)?		
Answer	Hydro Quebec participated in the development of CSA 293.3-08, which includes a formal Canadian waste classification system. The waste classification system applied at Hydro Quebec's Gentilly-2 facility is based on dose levels. Currently, Hydro Quebec utilizes two types of concrete bunkers (Standard B and C) to store LW and ILW. No segregation is carried out between LW or the ILW however, of measurements of dose rate are taken in contact with the pits after each transfer to ensure itself to meet the criteria of design. LLW is not further sub categorized.		

Q. No 125	Country	Article	Ref. in National Report
	Hungary	Article 32	B.5 p.15
Question/ Comment	The regulatory policy has been agreed with the public and industry stakeholders. The resulted policy is fully consistent with the Federal Policy Framework. a) What was the structure (frame, mechanism) of the discussions? b) Did any suggestions or questions remain open? c) How often is the Federal Policy Framework being reviewed or planned to be reviewed?		
Answer	Upon approval by the Commission Tribunal to proceed to public consultation, licences, stakeholders and other interested groups are given an opportunity to		

comment on the consultation process. Following the consultation process, the comments are considered and may result in changes to the document. The document is reviewed for legal soundness and presented to the Commission Tribunal for final approval.

There is no fixed schedule for reviewing the *Policy Framework for Radioactive Waste*. In 2008, Natural Resources Canada set up a Major Waste Owners' Forum, which meets periodically to discuss long-term radioactive waste management issues. At the February 2009 forum meeting, the major waste owners reaffirmed their support for the 1996 *Policy Framework*, which continues to provide an appropriate national context and principles for radioactive waste management in Canada.

Q. No 126	Country	Article	Ref. in National Report
	Hungary	Article 32	B.7.2 p.17

Question/ Comment: Please clarify the definition of long-lived and short-lived radioactive waste more exactly.

Answer: CSA standard N292.3 indicates that short-lived waste can be stored for decay purposes, to allow it to be cleared from regulatory control. The Standard indicates that this type of waste can be safety stored for a decay period of no more than a few years. A timeframe of two years was indicated as commonly used. This type of material does not generally require any significant shielding during handling and interim storage.

Very low-level long-lived waste is a low-hazard type material, but requires licensing as it is above the criteria for exemption. This type of waste has long half-lives, requiring a long-term management plan. Typically, it does not need a high degree of containment and/or isolation. A near-surface repository with limited regulatory control is generally suitable. This type of waste is best represented by tailings material from the uranium mine and mills processes.

Q. No 127	Country	Article	Ref. in National Report
	Hungary	Article 32	B10 p.20, Annex 5.1.8 p.162

Question/ Comment:

a) How does Canada handle the high level activity and/or long lived sources?

b) Is the licensee storing these sources for decades, or are all these shipped to AECL's CRL radioactive waste facility?

Answer: a) High activity-level or long-lived sources are securely stored at the licensee's facilities during their working life.

b) Licensees are responsible for managing their own long-lived wastes. Long-lived sources, used by hospitals, universities and industry, are managed in their own wastes on-site, with specific CNSC licence requirements or they are returned to the manufacturer or an authorized waste management operator such

as AECL CRL on a "fee for service" approach.

Q. No 128	Country	Article	Ref. in National Report
	Hungary	Article 32	D.3 p.26-29

Question/ Comment: The information on the inventory given in Table D.3, D.4, D.5 is limited (activity, activity concentration).

Answer: The absence of data on activity for some of the sites in tables is explained below:

For Chalk River facilities - radioactive wastes stored at CRL dates back to 1945. Due to the limitations associated with the waste characterization practices in the past, and the loss of waste-receipt records predating 1956 due to a fire, the total activities are not well known. AECL best estimates of the total activities are 11,770 TBq of solid LLW and 4,120 TBq of solid ILW.

Information on the radioactivity content of waste material associated with the Blind River and Port Hope uranium processing facilities in Table D.3 is not practically available. The vast majority of this activity is from the natural isotopic blend of natural uranium, without most of the associated decay products, due to the purification steps taken to segregate uranium from its progeny. This differs from the case of uranium mines and mills, where both tailings and waste rock typically contain the full array of progeny, and the uranium content of the feed ore, waste rock and tailings is routinely monitored. The complication for the uranium fuel manufacturing operations is largely a result of highly variable uranium content in the stored wastes, in addition to the variable levels of purification. We do not keep an inventory of stored uranium content in these low-level waste materials.

No values are shown for total activity at certain low-level sites/site locations from past practices, Table D.4, because of the general uncertainty of the nature and the volume of the wastes. That is, volumes at these bulk soils sites are not sufficiently delineated and characterized as to be accurate beyond that level required for conceptual planning.

Q. No 129	Country	Article	Ref. in National Report
	Ireland	Article 32	Table D.6, Page 30

Question/ Comment: With reference to the "Storage Method" given in the third column of table D.6, could Canada explain the difference between the two methods: "storing" (for Key Lake and McClean Lake Operations sites) and "holding" tailings (for Rabbit Lake site)?

Answer: There is no difference between the terms "holding" and "storing"; the latter term is appropriate for all three sites during their operational phases. It is also noted that although "storing" is used during the operational phases of the tailings management facilities, there is no intention of future retrieval. The facilities are

based on a "design for decommissioning" approach, where the decommissioned tailings management systems will be passively safe. There will be no need for any type of active treatment system for long-term environmental protection.

Q. No 130	Country	Article	Ref. in National Report
	Ireland	Article 32	Tables D.6, D.7, Page 30 and 31
Question/ Comment	With reference to the "Onsite Waste Inventory" given in the last column (subdivided in three) of tables D.6 and D.7, could Canada explain why mineralized and non-mineralized waste rock are differentiated from a hazard point of view?		
Answer	Mineralized and non-mineralized wastes are differentiated due to differences in potential environmental impacts. This is described in Section 6.3.3 of Annex 6, where the term "clean waste" is used to describe different types of unmineralized mining wastes (surficial soils, overburden soils, sandstone rock). These unmineralized wastes can be disposed in surface stockpiles or used on-site for construction purposes, with no risk of future environmental impact due to contaminant leaching. The term "special waste" is used in Section 6.3.3 to describe mineralized waste rock encountered as mining approaches the ore body. This mineralized waste rock is potentially acid-generating, because it may contain sulphide and/or is a source of contaminated leachates when exposed to an atmosphere containing oxygen. The special waste is segregated as it is mined, and temporarily stored. Subsequent disposal and flooding in mined-out pits, in order to cut off the oxygen supply from the atmosphere and stop oxidation reactions, is now a widely recognized long term solution.		

Q. No 131	Country	Article	Ref. in National Report
	Japan	Article 32	K4.2 (P102)
Question/ Comment	Do you plan to study geological formations other than Canadian Shield, in the APM program?		
Answer	APM has as its ultimate end-point the containment and isolation of spent fuel in a deep repository constructed in an appropriate geological formation. Canada has several potentially suitable host rock formations, including the crystalline rock of the Canadian Shield and sedimentary rock (www.nwmo.ca). NWMO is studying these host rock formations and developing conceptual designs and illustrative safety assessments for a deep geological repository in crystalline rock and in sedimentary rock.		

Q. No 132	Country	Article	Ref. in National Report
	Japan	Article 32	K.4.2 (P103)
Question/ Comment	Do you have a fixed concept of shallow underground storage of spent fuel? If you have, please show us the basic concept, including the period of interim step?		
Answer	APM includes an optional step of interim centralized shallow underground storage of spent fuel, while awaiting development of the deep geological repository at the final site. A preliminary conceptual design of a shallow rock		

cavern storage facility was developed, and is described in NWMO's Final Study (www.nwmo.ca). NWMO is continuing to study and advance the conceptual design for the interim storage of spent fuel.

Q. No 133	Country	Article	Ref. in National Report
	Japan	Article 32	K.4.2 (P103)
Question/ Comment	Do you expect the necessity of natural barriers to the central site of shallow underground spent fuel interim storage? In addition, please explain what functions you expect to the natural barriers.		
Answer	APM includes an optional step of interim centralized shallow underground storage of spent fuel, while awaiting development of the deep geological repository at the final site. A preliminary conceptual design of a shallow rock cavern storage facility was developed, and is described in NWMO's Final Study (www.nwmo.ca). While in shallow underground storage, the primary barrier between the spent fuel and the environment is the storage container. The natural rock mass above the underground storage facility does not provide a primary safety barrier.		

Q. No 134	Country	Article	Ref. in National Report
	Japan	Article 32	K.4.2 (P103)
Question/ Comment	What does "ADM" stand for?		
Answer	This was a typo in the Report. The correct term is "APM", which stands for "Adaptive Phased Management."		

Q. No 135	Country	Article	Ref. in National Report
	Japan	Article 32	K4.4 (P104)
Question/ Comment	Please show us outline of the total plan and initial five-year plan of the implementation of long term management plan?		
Answer	Canada's plan for long-term management of spent fuel (Adaptive Phased Management) will be implemented in phases, each marked by explicit decision points, with opportunities for input by Canadians. - The current phase of work involves preparation for the site selection process – the collaborative design of the site selection process and advancement of technical and social research to support siting. - The next phase will involve the start of the site selection process. - As the suitability of candidate sites is assessed in willing communities, NWMO will conduct detailed site evaluations to confirm the suitability of the sites, in terms of technical and scientific feasibility, safety and community well-being. - Following the selection of a preferred site in a willing community, the process of obtaining regulatory approvals will begin. - A further phase will involve the construction and operation of an underground characterization facility, as well as a research laboratory and related facilities, to confirm and demonstrate the safety of the		

repository.

- Licensing and construction of the deep repository will follow along with the associated surface facilities.
- The next phase will involve operation of the long-term management facilities, with transport of the spent fuel from the interim storage facilities at the nuclear reactor sites to the new central repository site.
- Provisions have been made for an extended period of monitoring in the deep geological repository, and post-closure monitoring, if required. Future decisions on when to close and backfill the repository will be made by the society, government institutions and processes of the day.

NWMO's five-year plan (2009-2013) sets out near-term strategic objectives that guide the implementation of Adaptive Phased Management. In this document NWMO identifies a number of milestones to be achieved in the next five years, such as:

- Development and confirmation of the site selection process.
- Launch of the site selection process after 2009.
- Development of NWMO's internal capability to respond to expressions of interest and initiate community evaluations and feasibility studies by 2011.
- By the end of 2012, having the internal capability and being in a state of readiness to begin technical and socio-economic assessment of potential candidate sites, in response to the interest expressed by communities. NWMO's technical and social research is building the foundation to support the implementation of these steps.
- Building the relationships with interested Canadians and Aboriginal people, and involving them in setting future direction.
- Continue to build NWMO as an implementing organization with a full range of capabilities.
- NWMO will review and adjust plans in response to changes in the external environment, including implications of new nuclear plants being built, for the volume and type of spent nuclear fuel to be managed.
- NWMO will continue to update total cost estimates for the program, and set out annual levels of trust fund deposits.

More detailed milestones for 2009-2013, including milestones for areas of geosciences, safety assessment and licensing, engineering and emerging technologies, are set out in NWMO's Implementation Plan, available on the Web site www.nwmo.ca

Q. No 136	Country	Article	Ref. in National Report
	Japan	Article 32	K.4.4 (P104)
Question/ Comment	When do you plan to confirm the site selection process?		
Answer	NWMO operates on the crucial principle that any interested communities, organizations, and citizens must provide comments, to help shape the ultimate		

process for selection of a site for the repository.

NWMO continues this collaborative development of the site selection process. In 2008, NWMO invited people to provide input on the key elements and considerations they would expect to see reflected in the process by which a willing host community is selected. With that input, NWMO began drafting a proposal for a site selection process. This draft proposal for a site selection process is planned to be issued in the Spring of 2009, for public review and confirmation through to late Fall 2009. The document will be issued as an invitation to interested Canadians to review and confirm the proposed process and/or suggest specific additions or changes that might improve and clarify the approach described. Discussion of this draft is expected as a means of confirming whether NWMO has accurately captured the expectations of citizens.

Depending upon the nature of comments received from Spring through Fall 2009, it may be possible to finalize and confirm the site selection process by the end of 2009. However, NWMO has not set a defined date by which the process must be finalized. The NWMO believes it is important to take the time required to enhance and confirm the site selection process with interested Canadians, prior to launching the site selection process.

Q. No 137	Country	Article	Ref. in National Report
	Japan	Article 32	K.5.1 (P107)
Question/ Comment	Do you plan to dispose of all the low and intermediate level radioactive waste stored in WWMF, into DRG? If not, please show us the waste acceptance provision of DRG?		
Answer	OPG plans to dispose of all low- and intermediate-level wastes currently stored at the WWMF in the proposed repository on the Bruce nuclear site. These wastes resulted from the operation and refurbishment of OPG-owned reactors.		

Q. No 138	Country	Article	Ref. in National Report
	Japan	Article 32	K.5.1 (P107)
Question/ Comment	What are the main reasons why the proposed depth of the repository is determined to be 680 meters below ground? On this occasion, to what extent and how were estimation of future amount of cumulative accumulation of waste to be disposed and other factors taken into consideration?		
Answer	The Bruce nuclear site has Ordovician sediments of extremely low permeability, at depths below 400m. From 400m to 600m the sediments are shale, and from 600m to 800m they are limestone. The limestone is preferred from a constructability point of view. The cost difference for a greater depth is not significant. A construction licence is being sought to build a repository for 160,000 cubic metres (as currently stored) of waste. This is the amount projected to be generated from existing OPG-owned reactors until the end of their life. The		

current design has been shown to be expandable, and capable to handle at least double this volume.

Q. No 139	Country	Article	Ref. in National Report
	Japan	Article 32	K5.3 (P110)
Question/ Comment	Does the historical low level radioactive waste not contain alpha nuclides?		
Answer	The presence of historic low-level radioactive waste (LLRW) in Canada is mostly a result of the radium and early uranium industry's handling and waste management practices. As a result, the content of historic LLRW includes various stages of processing, from raw ore to the refined product. For example, the refining of ores for radium resulted in a waste stream including uranium. Regardless of the process, the majority of the historic LLRW in Canada produced a waste stream that included all uranium-238 series progeny, including alpha, beta and gamma emitters, not to mention a very long list of associated heavy metals.		

Q. No 140	Country	Article	Ref. in National Report
	Japan	Article 32	B(P16)
Question/ Comment	Would you explain criteria or technical standard for uranium waste disposal?		
Answer	The decision as to whether uranium mine waste requires special management and/or disposal is based on an evaluation of potential public dose and environmental considerations. At the northern Saskatchewan uranium mining operations, consideration of potential public dose led to the use of a 0.03% U_3O_8 criteria in order to distinguish *clean* from *contaminated* waste rock; this roughly corresponds to a gamma level of 1.35 μ Sv/h. From an environmental perspective, a decommissioning close-out criteria of "background + 1 μSv/h" is used to establish when an area needs to be cleaned up; with background radiation typically in the 0.10 to 0.40 μSv/h range, this corresponds to 1.1 to 1.4 μSv/h. Other potential radioactive and non-radioactive contaminants in mine waste are also evaluated on the basis of potential public dose and risk to selected valued-ecosystem components.		

Q. No 141	Country	Article	Ref. in National Report
	Japan	Article 32	D4(P26)
Question/ Comment	Is the Table D.3 based on the categories of CSA standard?		
Answer	Yes, table D.3 was based on the categories of the CSA standard. However, it should be noted that the CSA waste categories are relatively new, and every effort was made to classify the waste into these categories. The low-level waste was not broken further down into short-lived and long-lived waste.		

Q. No 142	Country	Article	Ref. in National Report

	Japan	Article 32	B.7 (P16)
Question/ Comment	Will the CNSC endorse the CSA standard as the category of CNSC in the future?		
Answer	The technical committee and the core working group for the CSA standard N294 consist of representatives from the Canadian nuclear industry, the nuclear regulator (CNSC), other government bodies and universities. While N294 sets out the preliminary decommissioning plan requirements for Class I and Class II facilities, and serves as a guide or reference for other nuclear facilities, it is yet to be determined if N294 will become a CNSC requirement. A document becomes a CNSC requirement - or is legally binding to the CNSC - only if it is referenced in the licence.		

Q. No 143	Country	Article	Ref. in National Report
	Japan	Article 32	B7 (P16)
Question/ Comment	How do you categorize the radioactive waste without definitive numerical boundary by using the CSA standard, in actual applications?		
Answer	Radioactive wastes are classified into one of four categories (high-level, intermediate-level, low-level and uranium mine and mill tailings), based on their origin and radiological hazard. In Canada, the licensees are responsible to safely manage their own wastes. They must also demonstrate to the CNSC how they propose to fulfill this obligation. The CSA standard did not provide definitive numerical boundaries, as it was developed to provide licensees with a degree of flexibility in developing waste management plans, according to their operational and organizational needs.		

Q. No 144	Country	Article	Ref. in National Report
	Romania	Article 32	Section B, page 20
Question/ Comment	Please provide us more information about the long term strategy for the management of low and intermediate radioactive waste resulted from operation, refurbishment and decommissioning of NB Power and HQ.		
Answer	Considering that Hydro Quebec's Gentilly-2 facility and NB Power's Point Lepreau facility are both small radioactive waste producers, they will require an economical long-term plan in dealing with their intermediate and low-level wastes. In order to be successful and cost efficient, both NB Power and Hydro Quebec hope to enter into partnerships with larger nuclear power providers. Each company is examining various options, so as to find the best solution for their respective long-term needs.		

Q. No 145	Country	Article	Ref. in National Report
	Romania	Article 32	Annex 5, page 150
Question/ Comment	According to the report "These concrete structures are used to store the bulk of low-level wastes. Almost all the waste stored in the vaults is expected to decay		

to an insignificant level by the end of the design life of the structure". Please provide us more information about the plans related to this type of waste at the end of the design life of the structure.

Answer

At the end of design life of the Solid Radioactive Waste Management Facility (SRWFM), any low-level waste that has decayed below the clearance levels can be eliminated via conventional means. Any waste still registering levels above the release limits will either be moved to a new waste facility at the Point Lepreau site, or sent to a possible long-term waste management facility.

Q. No 146	Country	Article	Ref. in National Report
	Romania	Article 32	Annex 5, page 150

Question/ Comment

Could you provide us detailed information on projected operational L&ILW inventory and characteristics and on projected retubing and steam generator refurbishment waste inventory and characteristics (waste volumes and package inventory, radionuclide inventory, chemical inventory, bulk material inventory, uncertainties associated with concentrations of radionuclides and chemicals in operational and refurbishment L&ILW) stored or that will be stored at Point Lepreau Waste Management Facility?

Answer

NB Power estimates that 300 m^3 of low level wastes and 60 m^3 of intermediate level wastes will be produced from the refurbishment project.

NB Power has constructed the following storage structures to accommodate the reactor refurbishment waste:

Vaults: These concrete structures are used to store the bulk of low-level waste from the refurbishment of the reactor. There are approximately 890 cubic metres of storage available in the two vault structures.

Retube Canisters: These concrete structures are used to store intermediate-level waste from the refurbishment of the PLGS reactor (primarily reactor components). There are approximately 165 cubic metres of storage in the five structures.

Q. No 147	Country	Article	Ref. in National Report
	Romania	Article 32	Section B7.2, page 17

Question/ Comment

Why only sometimes ILW are subdivided into short and long life? Long-lived radionuclides generally require isolation for periods much longer than 300-500 years.

Answer

Intermediate-level waste can be subdivided into short- and long-life. The CSA standard did not provide these distinctions for ILW, as it did for LLW. It was considered important for the division of the LLW into sub-categories, whereas for ILW it was only provided as a note. This would allow the licensee some flexibility in developing a waste management plan based on their operational and organizational needs, while demonstrating to the CNSC how the licensees propose to safely manage their own waste.

With respect to the isolation of long-lived radionuclides, we agree that in many

cases the isolation periods could be much longer than 300-500 years.

Q. No 148	Country	Article	Ref. in National Report
	Romania	Article 32	Section B 7.3, page 17
Question/ Comment	What is generally considered LLW?		
Answer	LLW is generally material with a radionuclide content above established clearance levels and exemption quantities. The clearance levels and exemption quantities are identified in the CNSC *Nuclear Substance and Devices Regulations*. Typically, LLW can be classified by using a 2 mSv or less on-contact dose rate. This would allow the licensee some flexibility in developing a waste management plan based on their operational and organizational needs.		

Q. No 149	Country	Article	Ref. in National Report
	Romania	Article 32	Section B 7.4, page 18
Question/ Comment	What is happening with other NORM waste?		
Answer	NORM waste, known as *Naturally Occurring Nuclear Substances* (NONS) under the *Nuclear Safety and Control Act* (NSCA), are exempt from CNSC regulatory control except for the purposes of transportation, import and export. NONS that have been exempted under the NSCA, are under the jurisdiction of each Canadian province and territory. In relation to NONS, a Federal Provincial Territorial Radiation Protection Committee was established to support the radiation protection agencies at all levels of government in carrying out their respective mandates. They developed a NONS guideline titled "Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials" in 2000, to bring uniformity to the management of NONS-related radiation protection procedures. For further information, please visit Health Canada's Web site at: http://www.hc-sc.gc.ca/ewh-semt/pubs/contaminants/norm-mrn/index-eng.php		

Q. No 150	Country	Article	Ref. in National Report
	Russian Federation	Article 32	B 7, p.16
Question/ Comment	Which criteria is used to distinguish between low and medium level waste? Are waste removal options considered in the criteria?		
Answer	Under the Canadian regulatory system, it is the responsibility of the licensee to safely manage the waste they produce. The licensee must demonstrate to the CNSC how they propose to fulfill this obligation. The CSA standard did not provide definitive numerical boundaries. The intent of the standard was only to provide guidance, while allowing the licensee some flexibility in developing a waste management plan based on their operational and organizational needs. Typically, a 2 mSv on-contact dose rate is used to distinguish between LLW and ILW.		

Waste removal options are not considered in the criteria. As stated above, a measure of flexibility was introduced in the standard, in order to accommodate the licensees.

Q. No 151	Country	Article	Ref. in National Report
	Russian Federation	Article 32	B 7, p.17

Question/ Comment: Which criteria is used to define the VLLW sub-category?

Answer: Under the Canadian regulatory system, it is the responsibility of the licensee to safely manage the waste they produce.

The licensee must demonstrate to the CNSC how they propose to fulfill this obligation. The CSA standard did not provide definitive numerical boundaries. The intent of the standard was only to provide guidance, allowing the licensee some flexibility in developing a waste management plan based on their operational and organizational needs.

In general, VLLW is waste whose half-life is greater than two years.

Q. No 152	Country	Article	Ref. in National Report
	Russian Federation	Article 32	Annex 6.4.11, p.169

Question/ Comment: The water from tail storage is pumped out.
a) What other measures are reserved in case of pump failure?
b) How long the pumping system lasts? c) What happens when pumping is terminated?
d) Is there an alternative to this method?

Answer: Note: The responses are specific to the Deilmann Tailings Management Facility (DTMF) at Key Lake, which is the facility described on the referenced page.

a) Water could be removed from the DTMF through the surrounding groundwater wells; however, an extended unavailability of the pumping system (raise well system) is unlikely. A horizontal drift, filled with coarse waste rock, runs from the pit bottom drainage layer to the vertical raise well system, located outside the perimeter of the pit. The raise well submersible pumps can thus be readily removed for maintenance or replacement, with only a minimal increase in the elevation of the pond water during this operation. When pumping resumes, the elevation can be returned to its desired level.

b) The raise well pumping system will last through the remainder of the TMF operational life, and as subsequently needed during decommissioning (see below). As noted previously, the pumps can readily be maintained or replaced.

c) In order to describe what happens when pumping is terminated, the preliminary decommissioning plan (PDP) for the DTMF needs to be briefly

described.

- Upon completion of tailings placement, special waste rock and contaminated decommissioning wastes (dependent on the extent of other site decommissioning when the DTMF is decommissioned) would be directly disposed into the DTMF.
- A final 2-metre clean sand cover would be applied, by hydraulic deposition, over the tailings surface. Its purpose is to minimize contaminant transfer by diffusion from the underlying tailings to the (future) overlying water pond.
- The perimeter dewatering wells would then be turned off, and the pit allowed to gradually flood back to the natural ground water elevation.
- During the re-flooding period, pond water in the pit would be collected via a floating barge and/or the underdrain raise well system, and treated at the Key Lake water treatment facilities. The estimated "pump and treat" period is ten years.
- All pumping will be terminated when satisfactory water quality is achieved in the flooded pit.
- Passive long-term protection of the environment is achieved by the geochemical and geotechnical characteristics of the tailings, acting in combination with the characteristics of the surrounding physical system. This is further described in Section 6.3.2 of Annex 6, with specific details of the three operating tailings management facilities described in Sections 6.4.1.1, 6.4.2.1, and 6.4.3.1.

d) The currently operating in-pit tailings management systems described in Annex 6 represent the state-of-the-art. Although there are differences in detail, the Rabbit Lake, McClean Lake, and Key Lake (Deilmann) TMF's all use the same principles of hydraulic containment during operation, and passive containment for long-term environmental protection.

As noted in Sections 6.4.1.1 and 6.4.2.1 of Annex 6, and Section 7.6.2 of Annex 7, earlier systems using engineered above-ground tailings management facilities are located at three Northern Saskatchewan sites.

Q. No 153	Country	Article	Ref. in National Report
	Ukraine	Article 32	Para D.3.1, page 27-29
Question/ Comment	What explains the absence of data on activity of radwaste in tables?		
Answer	The absence of data on activity for some of the sites in tables is explained below:		

For Chalk River facilities - radioactive wastes stored at CRL dates back to 1945. Due to the limitations associated with the waste characterization practices in the past, and the loss of waste-receipt records predating 1956 due to a fire, the total activities are not well known. AECL best estimates of the total activities are

11,770 TBq of solid LLW and 4,120 TBq of solid ILW.

Information on the radioactivity content of waste material associated with the Blind River and Port Hope uranium processing facilities in Table D.3 is not practically available. The vast majority of this activity is from the natural isotopic blend of natural uranium, without most of the associated decay products, due to the purification steps taken to segregate uranium from its progeny. This differs from the case of uranium mines and mills, where both tailings and waste rock typically contain the full array of progeny, and the uranium content of the feed ore, waste rock and tailings is routinely monitored. The complication for the uranium fuel manufacturing operations is largely a result of highly variable uranium content in the stored wastes, in addition to the variable levels of purification. We do not keep an inventory of stored uranium content in these low-level waste materials.

No values are shown for total activity at certain low-level sites/site locations from past practices, Table D.4, because of the general uncertainty of the nature and the volume of the wastes. That is, volumes at these bulk soils sites are not sufficiently delineated and characterized as to be accurate beyond that level required for conceptual planning.

Q. No 154	Country	Article	Ref. in National Report
	Ukraine	Article 32	D.2, page 25
Question/ Comment	What regulatory requirements are in place in Canada concerning capacity of wet storages of spent fuel onsite nuclear generating stations and research reactors?		
Answer	There are no prescribed regulatory requirements concerning the capacity of wet storages for spent fuel at nuclear generating stations or research reactors. However, under the 3 (1) subsection (l) of the *General Nuclear Safety and Control Regulations*, an application for a licence shall contain the name, form, origin and volume of any radioactive waste or hazardous waste that may result from the activity to be licensed, including waste that may be stored managed, processed or disposed of at the site of the activity to be licensed, and the proposed method for managing and disposing of that waste. Hence, the licence applicant must demonstrate that it has sufficient capacity to manage its spent fuel, in a safe and secure manner.		

Q. No 155	Country	Article	Ref. in National Report
	Ukraine	Article 32	D.2 , page 25
Question/ Comment	What is the process of CANDU spent fuel management at all stages starting from unloading from Calandria till deposition in the Deep Geologic Repository. Describe it, please.		
Answer	There are water-filled fuel bays at each station, used for the initial cooling and shielding of spent fuel from OPG's reactor units. When the bays are nearing full capacity (and usually after 10 to 15 years of wet bay storage), the spent fuel is		

transferred to on-site dry storage facilities. OPG uses dry storage containers (DSCs) for onsite transportation and storage of spent fuel. A DSC is a free-standing reinforced concrete container, which can hold up to 384 spent fuel bundles. The DSCs are stored on-site, in industrial-type buildings dedicated to the interim storage of spent fuel, for up to 50 years. Eventually, the spent fuel will be transported to an appropriate off-site facility, for long-term storage. In Canada, the long-term management and eventual disposal of spent fuel is the responsibility of the federally-mandated Nuclear Waste Management Organization (NWMO).